IEA
OECD
heat pump programme
Annex 14

Operating Agent:
Japan

Working Fluids and Transport Phenomena in Advanced Absorption Heat Pumps

Final Report: Volume 1

Working Fluids and Transport Phenomena in Advanced Absorption Heat Pumps

(Final report: Volume 1)

Annex 14

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IEA OECD heat pump programme

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The IEA

The IEA was established in 1974 within the framework of the Organization for Economic Cooperation and Development (OECD) to implement an International Energy Programme. A basic aim of the IEA is to foster cooperation among the 22 IEA participating countries to increase energy security through energy conservation, development of alternative energy sources, new energy technology and research and development (R&D). This is achieved, in part, through a programme of energy technology and R&D collaboration, currently within the framework of over 40 Implementing Agreements.

The IEA Heat Pump Programme

The Implementing Agreement for a Programme of Research, Development, Demonstration and Promotion of Heat Pumping Technologies (IA) forms the legal basis for the IEA Heat Pump Programme. Signatories of the IA are either governments or organizations designated by their respective governments to conduct programmes in the field of energy conservation.

Under the IA collaborative tasks or 'Annexes' in the field of heat pumps are undertaken. These tasks are conducted on a cost-sharing and/or task-sharing basis by the participating countries. An Annex is in general coordinated by one country which acts as the Operating Agent (manager). Annexes have specific topics and workplans and operate for a specified period, usually several years. The objectives vary from information exchange to the development and implementation of technology. This report presents the results of one Annex. Coordination of activities and assistance to Operating Agents is provided by the Technical Support Services Unit, the administrative arm of the Programme. The Programme is governed by an Executive Committee, which monitors existing projects and identifies new areas where collaborative effort may be beneficial.

The IEA Heat Pump Centre

A central role within the IEA Heat Pump Programme is played by the IEA Heat Pump Centre (HPC), Annex 16. Consistent with the overall objective of the IA the HPC seeks to advance and disseminate knowledge about heat pumps, and promote their use wherever appropriate. Activities of the HPC include the production of a quarterly newsletter, the organization of workshops, an inquiry service, a promotion programme, and the performance of analyses. The HPC also publishes selected results from other Annexes, and this publication is one result of this activity.

For further information about the IEA Heat Pump Programme contact the Technical Support Services Unit (TSSU) and for inquiries on heat pump issues in general contact the IEA Heat Pump Centre at the following address:

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INTRODUCTION

Absorption heat pumps driven by heat in the mid-temperature range have been considered to be the optimum in the use of waste heat. One of the heat sources used in heat pumps is water and the other is air. It is not an exaggeration to say that air-source heat pumps are more widely applicable than water-source ones, so we have chosen to focus on advanced air-source absorption heat pumps.

The refrigerant plays a very important role in heat pump performance. It is closely related to the heat pump cycle. There have been a large number of studies done about refrigerants and comprehensive surveys of the data resulting from these studies, especially with reference to thermodynamic properties. Besides the thermodynamic properties, the transport properties of refrigerants are another key factor in the design of heat pumps. Research continues in several areas and is being published in several languages. It is appropriate that countries cooperate in an examination of the survey data of both the thermodynamic and transport properties of refrigerants.

1. Objectives

The objectives of Annex XIV were:

(1) To collect and evaluate data on working fluids and transport phenomena in components for advanced absorption heat pump systems;

(2) To offer appropriate proposals for future developments in this field; and

(3) To recommend future research and development programs.

2. Definitions

The work performed under this Annex was limited to the context of the following advanced absorption heat pumps:

- Compact-type high performance water-source heat pumps
- Air-source absorption heat pumps

The working fluids were studied on those related to air-source absorption heat pumps. And the activators were studied limited to absorption activators.

The transport phenomena were studied on: (i) Momentum transfer, (ii) Heat transfer, (iii) Mass transfer, and (iv) Interactions among these three transport phenomena.

3. Participating Countries

The countries participating in the Annex were Belgium, Denmark, the Federal Republic of Germany, Japan, Sweden, and the U.S.A.

4. Operating Agent

The Operating Agent is the Government of Japan, acting through the Heat Pump Technology Center of Japan.

5. Means

To accomplish the objectives of the Annex, the Participants undertake a jointly funded study on a task-sharing basis. The study consisted of the following elements:

a. Study on Working Fluids

(1) Literature survey

(i) Survey of literature on woking fluids

(ii) Transfer of non-confidential reports which include unpublished manufacturers' and government reports in relevant field by Participants, where available, to the Operating Agent

(2) Set-up of the matrix of working fluids

(i) Definition of the classification criteria

(ii) Set-up of the matrix

(3) Evaluation of working fluids

(i) Modelling of the thermodynamic evaluation

(ii) Evaluation based on the model

b. Study of Transport Phenomena

(1) Literaturey survey

(i) Survey of literature on absorption mechanisms

(ii) Transfer of non-confidential reports which include unpublished manufacturers' and government reports, in relevant field by Participants, where available, to the Operating Agent

(2) Set-up of the matrix of the phenomena and their related parameters

(i) Definition of the classification criteria

(ii) Set-up of the matrix

(3) Review of absorption performance

6. Meetings

The first working meeting was held at the Institute of the Gas Technology on September 19–20, 1988, in Chicago, Ill. The first day was workshop of presentations and discussions on literature survey in progress, absorption fluids data, advanced cycles and transport phenomena. After the workshop, the Participants visited research facilities of the Institute of Gas Technology. The second day was seminar on current situation of R&D of absorption technology. Topics covered were transport phenomena, solar absorption refrigeration, air-cooled absorption chiller-heaters, absorption heat pumps, resorption heat pumps, and heat transformers. The second working meeting was hosted by the Royal Institute of Technology on May 11–12, 1990, in Stockholm, Sweden. The first day of the meeting consisted of presentations and discussions on the literature survey in progress that is concerned with absorption fluid data, advanced cycles, and transport phenomena. The second day of the meeting consisted of a seminar on absorption heat pump technology. The topics included the R&D of advanced heat pumps including heat transformers, the application and marketing of heat pumps, and absorption phenomena on falling liquid film and others.

The first working meeting was held at the Hotel KKR Tokyo-Takebashi on March 11, 1990, in Tokyo, Japan. The meeting consisted of presentations and dicussions on the literature survey that is concerned with absorption fluid data, and advanced cycles.

7. Works

The activities of this Annex officially started on December 1, 1987. The collection of literature on working fluids and transport phenomena was finished on October 1990, based on the cooperative work of the Participants.

The Operating Agent prepared the Final Report Vol. II, consisting of the individual papers presented at the meetings of the seminar, on March 1990. The Operating Agent completed the Final Report Vol. I integrating all the results of the Task in March 1991, with the concurrence of all other Participants.

SUMMARY OF RESULTS

1. Introduction

The work performed under the Annex XIV is limited to the context of the following types of advanced absorption heat pumps:

- Compact high-performance water source heat pumps
- Air source absorption heat pumps

To accomplish the objectives, the Participants have undertaken a jointly funded study on a task-sharing basis.

Each Participant took responsibility for surveying the literature of its own country as well as of neighboring countries. The reports by F. Steimle et al. and by R. A. Macriss et al. were useful for our task. The study consists of the following survey elements:

Working fluids
Transport phenomena
Absorption cycles
Summary of investigation

Each report is summarized in the form of review sheet, and the completed sheets were transferred to the Operating Agent. To process and analyze the data, three Tasks were set up in the Operating Agent (Table S-1, and Appendix B).

Task 1 : Working Fluids Survey	(Chairman: Dr. E. Hihara)
Task 2 : Transport Phenomena Survey	(Chairman: Dr. T. Kashiwagi)
Task 3 : Absorption Cycles Survey	(Chairman: Mr. Y. Nagaoka)

2. Task 1 : Working Fluids Survey

About 500 publications covering thermophysical properties, advanced absorption cycles and transport phenomena were selected and reviewed, referring to the previous reports and the data base.

The number of collected literature is:

264 for thermophysical properties,
132 for absorption cycles, and
102 for transport phenomena.

The references were reviewed by the Participants on a task-sharing basis. The contents of the collected review sheets were entered into a microcomputer data base. The data base structure composed of bibliographical data and fluids data is shown in Table 1-1. Abbreviated chemical names of materials are listed in Tables 1-3 and 1-4, together with the organic/inorganic compounds numbers given in *Handbook of Chemistry and Physics, 69ed.*

The literature index consists of two parts: for materials and for key mixtures. Materials are arranged in the alphabetical order of abbreviated name. For the specified materials both the first author's name and the paper number are listed (Tables 1-5 and 1-6). For mixtures, 43 key fluids are listed in Table 1-57 Name of the first author, the data number, and the categories of the study can be referred to in Table 1-8.

For further research, the following items can be pointed out.

(1) For practical use of thermodynamic property data of mixture, the numerical expression in the form of equation is convenient. The studies which involve numerical expressions are listed in Table 1-2 for the key mixtures. More efforts for numerical expressions are requested.

(2) Refrigerants such as R123 and R134a may be promising as refrigerant alternatives to the fully halogenated chlorofluorocarbons. Research on the thermophysical properties of mixtures with CFC alternatives should be encouraged.

(3) As to the transport properties, such as viscosity, diffusion coefficient, and thermal conductivity, experimental investigation is necessary as well as estimation formula, especially for electrolyte solution at high concentration.

(4) Chemical instability, toxicity, and corrosion characteristics of mixture are indispensable for the practical design. More methodical experimental data are needed.

3. Task 2 : Transport Phenomena Survey

In the task concerned with transport phenomena, phenomena such as mass transfer, heat transfer, momentum transfer, and their interaction have been surveyed. Phenomena in the absorber and the generator were targeted. Dr. Kashiwagi and his group set up the mitrices based on the review of nearly 100 recent papers. The results are as follows:

(1) The matrix between key items of phenomena and the number of related papers is given in Table 2-1.

(2) The matrix between the authors of papers and the relevant key items of phenomena is given in Tables 2-2(A) and 2-2(B).

The items for which information is lacking are as follows:

Absorber:

* Two-phase flow patterns, such as mist flow and pulsating flow
* The effect of electromagnetism, and vibration on absorption enhancement
* Analytical thermodynamic modeling of the absorption process

Generator:

* The effect of wave generated at the interface
* The effect of surfactants, stirring, and mixing on the characteristics of boiling and evaporation
* Two-phse flow patterns and their modelling

4. Task 3 : Absorption Cycles Survey

Mr. Nagaoka and his absorption cycle group made fundamental evaluations of 72 cycles referring to Grossman's and Alfeld's analysis.

The items evaluated are:

Number of main components (NM):	NM<5
Number of auxiliary components (NA):	NA<2
Coefficient of performance (COP):	COP>2
Temperature factor (TF):	TF>2
Transfer surface coefficient (TSC):	TSC>1/4 for refrigeration
	TSC>1/2 for heat pump

Consequently, four cycles and nine working fluids were selected. They were examined under the following conditions.

Temperature: Te=5°C and Tc=35°C for refrigeration
Te=–5°C and Tc=50°C for heat pump

Possibility of commercial operation:
Maximum pressure is below 2MPa or 2000kPa
Maximum temperature is below 160°C

The screening outline is shown in Table 3-23 and the results are described in Tables 3-29 to 3-40.

As the next step, the characteristic figures were caculated under the following conditions:

Te=5°C, Tc=35°C and Ta=35°C for refrigeration cycle
Te=–5°C, Tc=50°C and Ta=50°C for heat pump cycle

The cycles were evaluated under the condition that COP is not less than 1.2 for both the refrigeration and heat pump cycles. The classification of cycles is defined in Table 3-1 referring to the terms used in the literature.

The screening results are shown in Table 3-20.

Refrigeration cycle

- Double effect cycle (1) using Water/LiBr or TFE/NMP
- Double effect cycle (2) using TFE/NMP

COP of triple effect cycle in the refrigeration mode is larger than 1.2 but the maximum temperature of the cycle exceeds 160°C.

Heat pump cycle

- Single effect cycle using Ammonia/Water, TFE/NMP, or R22/DTG

– Two-cascade cycle using Ammonia/Water, TFE/NMP, or R22/DTG
in the lower temprature loop, and using Water/LiBr in the higher temperature loop.

There is no cycle for which the COP is larger than 1.2 for both the refrigeration mode and the heat pump mode.

5. Recommendation of Investigation

As to thermophysical properties, the number of articles found in the literature amounts to about 500, but investiation of the following items is still required.

* Expression of properties in the form of equations
* Thermophysical properties of refrigerations as alternatives to fully halogenated chlorofluorocarbons
* Transport properties of electrolyte solution at high concentration
* Chemical instability, corrosion, toxicity, etc.

As to the transport phenomena the investigation of the following items is requested:

Absorber:

* Two-phase flow patterns, such as mist flow and pulsating flow
* The effects of electromagnetism, and vibration on absorption enhancement
* Analytical thermodynamic modelling of the absorption process

Generator:

* The effect of wave generated at the interface
* The effect of surfactants, stirring, and mixing on the charcteristics of boiling and evaporation
* Two-phse flow patterns and their modelling

The following cycles are recommended for the future prototype study.

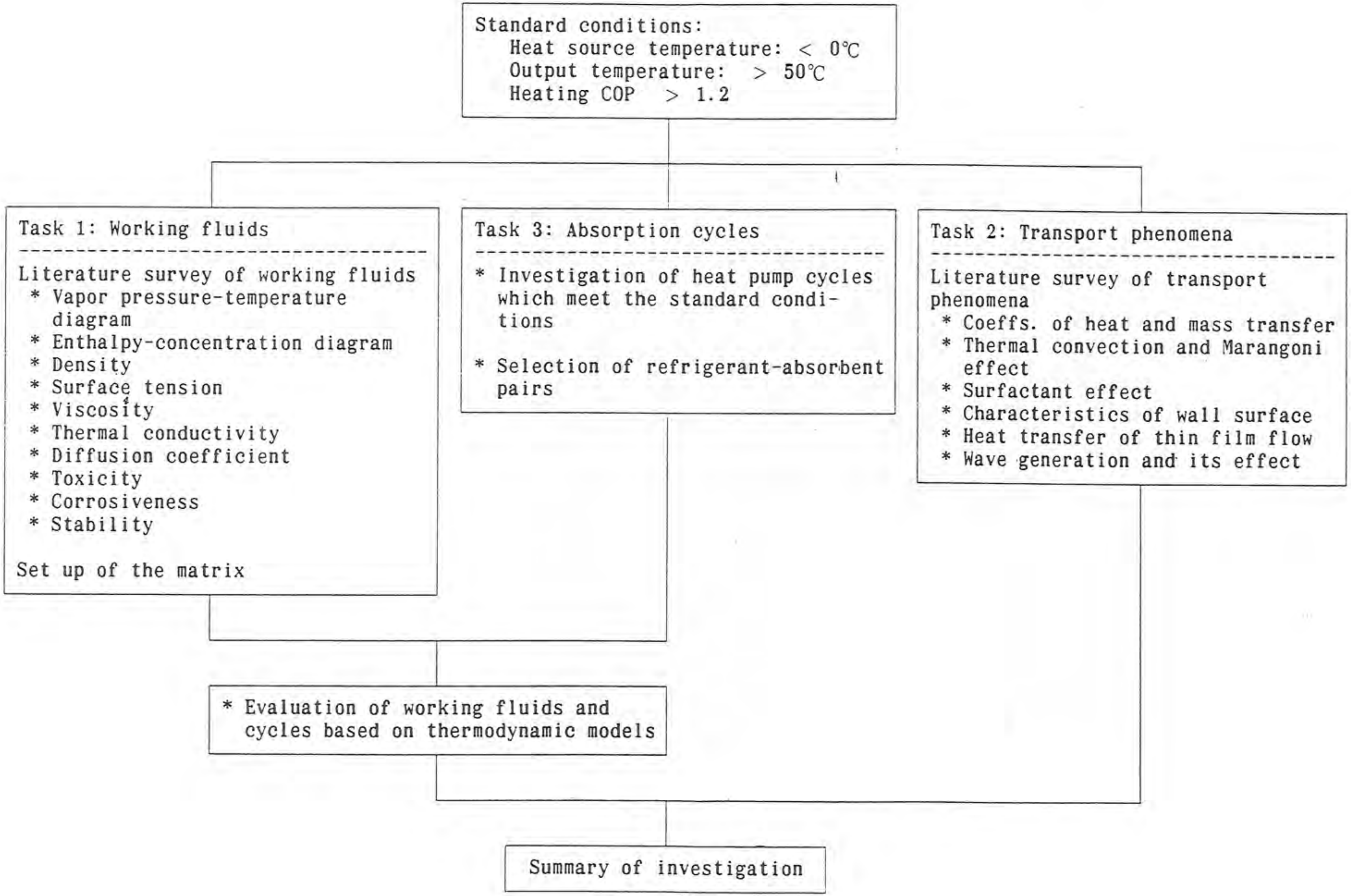
Refrigeration cycle:

* Double effect cycle (1) using Water/LiBr or TFE/NMP
* Double effect cycle (2) using TFE/NMP

Heat pump cycle:

* Single effect cycle using Ammonia/Water, TFE/NMP, or R22/DTG
* Two-cascade cycle using Ammonia/Water, TFE/NMP, or R22/DTG
  in the lower temperature loop, and using Water/LiBr in the higher temperature loop

Fig. S-1 Procedure of IEA-Annex 14



CLOSING COMMENTS

A solution to the energy problem has primarily focused on the decrease of energy consumption in relation to economic growth. However, recent worldwide discussions on the global environment have introduced a new point of view. Additionally, the Gulf Crisis has increased the importance of a secure oil supply system. Heat pump technology, which is expected to play an important role in the saving of energy, has been enjoying a stable position in domestic use because people have learned to expect the type of heating and cooling that only heat pumps can drive.

At the same time, many enterprises intend to adopt the heat pump in order to use waste heat. In the current situation, where heat pump systems are expanding n several directions, absorption heat pump technology is especially valued. Under such circumstances, the activities of Annex XIV were very significant. Because absorption technology continues to contribute to energy saving and a pollution-free environment, such research and development projects as in the following list are considered important s extensions of our future study and can be performed based on the results of our activities. We believe that the following three areas of research and development will be beneficial to environmental causes:

(1) High-performance absorption technology which stresses high temperature rather than high quantities of heat.

(2) Utilization of lower temperature heat source to drive heat pump machines as well as the source of heat.

(3) New cycles such as the second sort of absorption heat pump (heat transformer or temperature amplifier) and the hybrid compression-absorption system.

Task 1 : Working Fluids Survey

1. Literature Survey

1.1 Summary

1. Literature Survey

1.1 Summary

About 500 publications covering thermophysical properties, advanced absorption cycles and transport phenomena were selected and reviewed. The information on references contained in this survey was selected from the previously reported fluids data surveys and some data bases, listed below.

- R. A. Macriss, J. M. Gutraj and T. S. Zawacki, "Absorption fluids data survey: final report on worldwide data," Inst. Gas Technolog, U.S. Dep. Energy, ORNL/Sub/84-47989/3, 1988.
- F. Steimle, H. Bokelmann and H. J. Ehmke, "Arbeitsstoffsysteme für eine Sorptionswärmepumpe, Kommission der Europaischen Gmeiscgaften, 1984.
- Data Base: CAS (Chemical Abstract Service)
  EI Engineering Meetings (Engineering Information)
  COMPENDEX (Engineering Information)
  JOIS (Japan Information Center of Science and Technology)

Besides the Operating Agent, the Particpants collected some references. The collected references were classified into three groups:

Group	Number of references
Thermophysical properties	264
Absorption cycles	132
Transport phenomena	102

All of the references were reviewed by the Participants on a task sharing basis.

To arrange the reviewed information, a data base was developed on a microcomputer. The data base consists of two parts: bibliographical data and fluids data. Detailed structure is shown in Table 1-1.

Table 1-1 Structure of the data base

<u>Bibliographical data</u>
- Paper number
- Author(s)
- Title in original language
- Title in English, if necessary
- Source
- Year
- Type of document
- Language
- General comments

<u>Fluids data</u>
- Paper and data number
- Name of fluids
- Categories studied
- Experimental conditions
  - pressure
  - temperature
  - concentration
- Comments

Abbreviations of the materials were arbitrarily determined from the chemical names, shown in Tables 1-3 and 1-4. The organic/inorganic compound numbers, given in *Handbook of chemistry and physics, 60ed.*, are shown in the abbreviation list. Basic physical properties of the materials, such as molecular weight, boiling point and melting point, can be obtained from the handbook.
Example:

Abbreviation	Chemical Formula	Chemical Name and Synonyms	No.*
AA	CH_2CO_2H	Acetic acid or Ethanoic acid	175
Act	CH_3COCH_3	Acetone or 2-Propanone	306

Literature index for materials and key mixtures were made with the aid of the data base. The literature index for materials is arranged in the alphabetic order of abbreviations of materials. Name of the first author and the paper number of the literature, in which the specified material has been studied, are listed in Tables 1-5 and 1-6.
Example:

WA

Alefeld, G (D183)	Bach, R.O. (D185)
Baud, E. (B016)	Baud, E. (B017)
Biermann, W.J. (A022)	Biermann, W.J. (A023)
Bokelmann, H. (C028)	Bokelmann, H. (D015)
Bokelmann, H. (D012)	Bokelmann, H. (C031)

As shown in Table 1-7, 43 key fluids were arbitrarily selected. The literature index for the key mixtures was made. Name of the first author, the data number and categories of the study are shown in Table 1-8.
Example:

*** WORKING FLUIDS ***
Fluid 1 : TFE
Fluid 2 : NMP

*** Author **********	Data No *******	Category ******
Bokelmann, H.	D014-01	PVT-X, Viscosity Stability
Bokelmann, H.	C028-05	PVT-X, Solubility
Bokelmann, H.	D015-01	
Bokelmann, H.	B033-40	PVT-X, Solubility

Detailed information on the literature can be obtained from "1.4 References", in which all of the bibliographical and fluids data are dumped in the alphabetical order of the first author.
Example:

--- ------------------------------

Author(s): Agarwal, R.S. Bapat, S.L.
Title: Solubility characteristics of R22-DMF refrigerant-absorbent combination.
Source: Int. J. Refrig., Vol.8, No.2, 1985, p70-74.
Paper No.: D275 Language: English
Reviewer: Japan-J Doc. type: Journal
Comment: Measures equilibrium vapor pressure of R22-DMF, and expresses it in terms of P-1/T relations. The gas phase is

treated as an ideal solution.

Data No.: D275-01
Fluids: R22, DMF
Category: PVT-X
Pressure: 0.014 - 15,783 bar
Temp.: –25 - 120 C
Conc.: 0 - 100 mass% R22

As a recommendation for further research, the following items can be pointed out.

(1) From a standpoint of the practical use, numerical expressions of thermophysical properties of mixtures are expected. For the key mixtures, however, few numerical expressions are available. More efforts to present numerical expressions are desired.

Table 1-2 List of literature which gives numerical expressions of thermophysical properties

Fluids	Author	Category studied
Water - Lithium bromide	McNecly, 1979	PVT-X, enthalpy
	Herold, 1987	Gibbs free energy
	Patterson, 1988	PVT-X, enthalpy
Ammonia - Water	Jain, 1971	PVT-X, enthalpy
	Ziegler, 1984	Gibbs free energy
R22 - DMEDEG	Ando, 1984	PVT-X, enthalpy
R22 - DMF	Jelinek, 1980	PVT-X, enthalpy
	Ando, 1982	PVT-X
	Tyagi, 1984	PVT-X
R123a - ETFE	Murphy, 1983	PVT-X, enthalpy
TFE - NMP	Uemura, 1973	PVT-X, enthalpy

(2) Alternatives to the fully halogenated chlorofluorocarbons such as R123a and R134a may be promising as a refrigerant. Research on the thermophysical properties of mixtures with CFC alternatives should be encouraged.

(3) Chemical instability or corrosion characteristics of the mixture are indispensable information for the practical design. More methodical experimental data are desired.

1.2 List of Abbreviations

1.2 List of Abbreviations

Table 1-3 List of abbreviations for organic compounds

Abbreviation	Chemical Formula	Chemical Name and Synonyms	No.*
AA	CH_2CO_2H	Acetic acid or Ethanoic acid	175
Act	CH_3COCH_3	Acetone or 2-Propanone	306
AdN	$NC(CH_2)_4CN$	Adiponitrile	545
AMP	$C_4H_{11}N_2$	2-Amino-2-methyl-1,3-propandiol	
AN	$C_6H_5NH_2$	Aniline or Phenylamine	765
APN	$C_6H_5COCH_3$	Acetophenone or Methyl phenyl ketone	351
BAD	C_6H_5CHO	Benzaldehyde	1654
n-BDEA	$n\text{-}C_4H_9N(CH_2CH_2OH)_2$	n-Butyl diethanolamine or Butyl bis(2-hydroxyethyl) amine	4083
1,4 BDL	HOC_4H_8OH	1,4-Butanediol or Tetramethylene glycol	3833
2,3 BDL	$CH_3CHOHCHOHCH_3$	2,3-Butanediol	3838
BDS		Butyl disulfide	
BEHA	$C_{22}H_{42}O_4$	Bis(2-ethylhexyl)adipate or Di(2-ethylhexyl) ester adipic acid	534
BEHP	$C_{24}H_{38}O_4$	Bis(2-ethylhexyl)phthalate	
BEHS	$C_{26}H_{50}O_4$	Bis(2-ethylhexyl)sebacate or Dimethylester sebacic acid	13191
BImi	$C_7H_6N_2$	Benzimidazole or 1,3-Benzodiazole	2493
BL	$C_4H_6O_2$	γ-Butyrolactone	4419
Bpy	$C_{10}H_8N_2$	Bipyridyl	3530
BTr	$C_6H_4N_3H$	1,2,3-Benzotriazole, Azimidobenzene or COBRATEC 99	3115
BZL	C_7H_5NS	Benzothiazole	3078
C100	$C_6H_3N_3HCH_3$	COBRATEC 100	
CA	$C_6H_4Cl(NH_2)$	m-Chloroaniline	803/4
CF	$CHCl_3$	Chloroform or Trichloromethane	9098
CHN	$C_6H_{10}O$	Cyclohexanone	5621
DAl	$CH_3(CH_2)_9OH$	n-Decyl alcohol or 1-Decanol	5921
DAm	$CH_3(CH_2)_9NH_2$	n-Decylamine or 1-Aminodecane	5900

DBAd	$C_{14}H_{26}O_4$	Dibutyl adipate or Dibutylester adipic acid	530
DBAm	$(C_6H_5CH_2)_2NH$	Dibenzylamine	6041
DBE	$(C_6H_5CH_2)_2O$	Dibenzylether or Benzylether	3255
DBEEG		Dibutyl ether ethylene glycol	
DBF	$C_{12}H_{20}O_4$	Di-n-butylfumarate or Dibutylester fumaric acid	7101
DBM	$C_{12}H_{20}O_4$	Dibutylmaleate	
DBP	$C_6H_4(CO_2C_4H_9)_2$	Dibutyl phthalate or Dibutylester phthalic acid	11462
DCHA	$C_{12}H_{33}N$	Dicyclohexylamine	
DDAl	$CH_3(CH_2)_{11}OH$	n-Dodecyl alcohol, 1-Dodecanol or Lauryl alcohol	6409
DDPE		1,2-Dihydroxy-1-2 bis(dihydroxyphosphonyl)ethane	
DEAlA	$C_4H_{11}NO_2$	Diethanolamine	6087
DEAP	$C_2H_5O_2C(C_2H_4)_4CO_2C_2H_5$	Diethyl adipate or Diethylester adipic acid	532
DECAd	$(C_2H_5)_2NCN$	Diethyl cyanamide	5411
DEE	$(C_2H_5)_2O$	Diethyl ether or Ethyl ether	6791
DEG	$(HOCH_2CH_2)_2O$	Diethylene glycol	6111
DEGBEA	$C_{10}H_{20}O_4$	Diethylene glycol monobuthyl ether - acetate	6113
DEF	$CHON(C_2H_5)_2$	N,N-Diethyl formamide	7059
DEM	$CH_2(CO_2C_2H_5)_2$	Diethyl malonate or Dietylester malonic acid	8866
DEO	$C_2H_5O_2CCO_2C_2H_5$	Diethyl oxalate or Diethylester oxalic acid	10175
DEP	$C_{12}H_{14}O_4$	Diethyl phthalate	
DIBP		Diisobutyl phospite	
DIPCAd		Diisopropylcyanamide	
DMAm	$(CH_3)_2NH$	Dimethylamine	6156
DMA	$CH_3CON(CH_3)_2$	N,N-Dimethyl acetamide	74
DMAn	$C_6H_5N(CH_3)_2$	N,N-Dimethyl aniline	872
DMCAd		Dimethylcyanamide	
DMEDEG	$CH_3(OC_2H_4)_2OCH_3$	Dimethyl ther diethylene glycol	6118
DMEEG		Dimethylether ethylene glycol or 1,2-Dimethoxyethane	6893
DMETEG	$CH_3(OC_2H_4)_3OCH_3$	Dimethylether tetraethylene glycol or E181	13748
DMETrEG	$CH_3(OC_2H_4)_4OCH_3$	Dimethylether triethylene glycol	

DMF	$CHON(CH_3)_2$	N,N-Dimethyl formamide	7060
DMMP	$CH_3PO(OCH_3)_2$	Dimethyl methylphosphonate or Dimethylester methanephosphonic acid	9111
DMP	$C_6H_4(CO_2CH_3)_2$	Dimethyl phthalate	
DMS	$(CH_3)_2S$	Dimethyl sulfide or Methyl sulfide	9199
DMSl		Dimethyl sulfolane	
DMSO	$(CH_3)_2SO$	Dimethyl sulfoxide or Methyl sulfoxide	9202
DO	$C_{10}H_{22}O$	3,6-Dimethyl 3-octanol	10089
DoAd	$CH_3(CH_2)_{20}CONH_2$	Docosanamide	
DoAl	$CH_3(CH_2)_{21}OH$	n-Docosyl Alcohol or 1-Docosanol	6385
DoAm	$CH_3(CH_2)_{21}NH_2$	n-Docosylamine	
DWA	$(C_6H_5)_2O$	Dowthern A	
EA	$C_2H_5NH_2$	Ethylamine	6754
EAl	C_2H_5OH	Ethanol or Ethyl alcohol	6708
EB	$C_6H_5CO_2C_2H_5$	Ethyl benzoate or Ethylester benzoic acid	2690
EEDEG	$C_2H_5(OCH_2CH_2)_2OH$	Ethylether diethylene glycol	
EFA		Ethyl formamide	
EG	HOC_2H_4OH	Ethylene glycol or Ethanediol	6883
EiAl	$CH_3(CH_2)_{19}OH$	n-Eicosyl Alcohol or 1-Eicosanol	6453
EL	$CH_3(CH_2)_{10}CO_2C_2H_5$	Ethyl laurate or Ethylester lauric acid	8710
ElA	$H_2NCH_2CH_2OH$	Ethanolamine or 2-Aminoethanol	6727
EMPO		1-Ethyl-3-methyl-phospholine-1-oxide	
EP	$C_6H_{11}NO$	1-Ethyl-2-pyrrolidon or Dimethyl 2-pyrrolidon	12672/3
EPh		Ethylene phosphite	
ES		Ethyl sulfide	
ESE		Ethylsulfonyl ethanol	
ETFE	$(C_4H_7O)CH_2OC_2H_5$	Ethyl tetrahydro furfuryl ether	
FP	$(C_5H_{10}N)CHO$	N-Formylpiperidine or N-Piperidine carboxaldehyd	11695
GYL	$CH_2OHQCHOHQCH_2OH$	Glycerol or 1,2,3-Trihydroxy propane glycerin	7354
n-HA	$n-C_7H_{15}OH$	1-Heptanol or n-Heptyl alcohol	7602

HAd	$CH_3(CH_2)_4CONH_2$	Caproamide or Hexananoamide	7568
HAl	$CH_3(CH_2)_5OH$	n-Hexyl alcohol or 1-Hexanol	7868
HAm	$CH_3(CH_2)_5NH_2$	n-Hexylamine or 1-Aminohexane	7987
HDAl	$CH_3(CH_2)_{15}OH$	n-Hexadecyl alcohol or 1-Hexadecanol	7712
HFB		Heptafluorobuthanol	
HFIP	$(CF_3)_2CH\text{-}OH$	Hexafluoroisopropanol	
HFP	$CH_3CHOHCF_3$	Hexafluoropropane-2-ol or 1,1,1-Trifluoro-2-propanol	12004
HMPT	$C_6H_{18}N_3OP$	Hexametyl phosphoric acid triamide	11409
HX	$CH_3(CH_2)_4CH_3$	Hexane	7760
IBA	$CH_3CO_2CH_2CH(CH_3)_2$	Isobutyl acetate or Isobutylester acetic acid	186
Imi	$C_3H_4N_2$	Imidazole or 1,3-Diazole. glyoxaline	8325
IPN	$C_9H_{14}O$	Isophorone or 3,5,5-Trimethyl-2-cyclohexene-1-on	8541
IQUN	C_9H_7N	Isoquinoline	8581
LLA	$C_{18}H_{32}O_2$	Linoleic acid or 9,12-Octadecadienoic acid	8764
LO		2,6-Lutidine-N-oxide	
MA	CH_3NH_2	Methylamine or Aminomethane	9148
MAl	CH_3OH	Methanol or Methyl alcohol	9127
MD		4-Methyldecanil-4	
MEA	$C_3H_9NO_2$	N-Methylethanolamine or 2-(Methylamino)ethanol	6734
MFAd	$HCONHCH_3$	N-Methylformamide	7064
MIm	$C_4H_6N_2$	2-Methylimidazol	8328/9
MM	$C_5H_{11}NO$	N-Methylmorpholine	9236?
MP		5-Methyl-2-pyrrolidone	
Nat	$C_{10}H_8O$	α-Naphthol or 1-Hydroxy naphthalene	9571
NB	$C_6H_5NO_2$	Nitrobenzene	2194
NMP	C_5H_9NO	N-Methyl-2-pyrrolidone	12674
NP	$CH_3CH_2CH_2NO_2$	1-Nitropropane	2194
NPAl		Nonylphenyl alcohol	
OA	$C_{18}H_{34}O_2$	Oleic acid or 9,10-Octadecenoic acid	10139
OAl	$CH_3(CH_2)_7OH$	n-Octyl alcohol or 1-Octanol	10079

OC	$C_9H_{17}N$	Octyl cyanide	
OCA	$C_8H_{17}NH_2$	Octylamine or 1-Aminooctane	10028
OCN	$CH_3(CH_2)_5COCH_3$	2-Octanone or Methyl hexyl ketone	10094
ODAd	$CH_3(CH_2)_{16}CONH_2$	Octadecanamide or Stearamide	13379
ODAl	$CH_3(CH_2)_{17}OH$	n-Octadecyl alcohol, Stearyl alcohol or 1-Octadecanol	9993
ODAm	$CH_3(CH_2)_{17}NH_2$	n-Octadecylamine, Stearylamine or 1-Aminooctadecane	9982
PAl	$CH_3(CH_2)_2OH$	n-Propyl alcohol or 1-Propanol	11942
PDN	$CH_3COCH_2COCH_3$	2,4-Pentanedione or Acetylacetone	10442
PDS	ND	Polydimethylsiloxane	
PFP	$CF_3CF_2CH_2OH$	Pentafluoropropan-1-ol	
PPA	CH_3CH_2COOH	Propionic acid or Propanoic acid	12072
PVImi		Poly-vinylimidazole	
Pyr	C_4H_7NO	2-Pyrrolidone or γ-Butyrolactam	12671
Pyri	C_5H_5N	Pyridine	12441
QUN	C_9H_7N	Quinoline	12719
R11	CCl_3F		
R12	CCl_2F_2		
R123a	$CHClFCClF_2$		
R124	$CHClFCF_3$		
R124a	CHF_2CClF_2		
R131a	$CHCl_2CHClF$		
R133a	CHF_2CHClF		
R134	CHF_2CHF_2		
R152	CH_2FCH_2F		
R21	$CHFCl_2$		
R22	CHF_2Cl		
R30	CH_2Cl_2		
R31	CH_2ClF		
Sul	$C_4H_8SO_2$	Sulfolane or Tetramethylene sulfone	

TAN	$CH_3CO_2CH(CH_2O_2CCH_3)_2$	Triacetin or Glycerol triacetate	14398
TBP	$(CH_3CH_2CH_2CH_2O)_3PO$	Tributyl phosphate or Tributylester phosphonic acid	11410
TCP	$C_{21}H_{21}O_4P$	Tri-p-cresyl phosphate or p-Cresyl phosphate	5378
TDAd	$CH_3(CH_2)_{12}CONH_2$	Tetradecanamide or Myristamide	9250
TDAl	$CH_3(CH_2)_{13}OH$	n-Tetradecyl alcohol, 1-Tetradecanol or Myristyl alcohol	9261
TDAm	$CH_3(CH_2)_{13}NH_2$	n-Tetradecylamine, 1-Aminotetradecane or Myristylamine	13727
TEA	$C_6H_{15}NO_3$	Triethanolamine or tris-(2-Hydroxyethyl)amine	8228
TEAm	$(C_2H_5)_3N$	Triethylamine	14483
TEG	$H(OC_2H_4)_4OH$	Tetraethylene glycol	13747
TEPA	$C_8H_{23}N_5$	Tetraethylenepentamine	13750
TFA	C_2F_3COOH	Trifluoro acetate	
TFE	$C_2H_2F_3OH$	Trifluoro ethanol	6724
TFP	$CHF_2CF_2CH_2OH$	Tetrafluoropropan-1-ol	11970
THQ	$C_9H_{11}N$	Tetrahydroisoquimoline	12908?
THF	C_4H_8O	Tetrahydrofuran	7142
Thy	$C_{10}H_{14}O$	Thymol or 2-Methyl-5-isopropylphenol	14032
TIBP		Triisobutyl phospate	
TMA	$(CH_3)_3N$	Trimethylamine	14483
TMS	$[(CH_3)_2N\text{-}CO\text{-}CH_2\text{-})]_2$	N, N, N, N-Tetramethylsuccinamide	
TMU	$[(CH_3)_2N]_2CO$	Tetramethylurea	14765
TrEG	$[-CH_2OCH_2CH_2OH]_2$	Triethylene glycol	14487
TrFP	$CF_3CHOHCH_3$	Trifluoropropan-2-ol	12004
VA	$C_5H_{10}O_2$	Valeric acid or Pentanoic acid	14808

NS ······ Not specified.

*) Number of organic compounds in "Handbook of chemistry and physics, 69ed.," CRC.

Table 1-4 List of abbreviations for inorganic compounds

Abbreviation	Chemical Formula	Chemical Name	No.*
AB	NH_4Br	Ammonium bromide	a94
AI	NH_4I	Ammonium iodide	a164
AM	NH_3	Ammonia	a76
BaC	$BaCl_2$	Barium chloride	b26
CB	$CaBr_2$	Calcium bromide	c84
CC	$CaCl_2$	Calcium chloride	c95
CDO	CO_2	Carbon deoxide	c221
KT	KSCN	Potassium thiocyanate	
LB	LiBr	Lithium bromide	l163
LC	LiCl	Lithium chloride	l172
LCr	Li_2CrO_4	Lithium chromate	(l175)
LCT	$LiClO_3$	Lithium chlorate	l168
LI	LiI	Lithium iodide	l189
LM	$Li_6(Mo_7O_{24})\cdot 12H_2O$		
LN	Li_3N	Lithium nitrite	l197
LNT	$LiNO_3$	Lithium nitrate	l195
LT	LiSCN	Lithium thiocyanate	l224
MgC	$MgCl_2$	Magnesium chloride	m34
MnC	$MnCl_2$	Manganese dichloride	m115
NiC	$NiCl_2$	Nickel chlrorlide	n57
OPA	H_3PO_4	Orthophosphoric acid	
PB	KBr	Potassium bromide	p216
PC	K_2CO_3	Potassium carbonate	p232
PH	KOH	Potassium hydroxide	p328
PN	KNO_3	Potassium nitrate	p381
SA	H_2SO_4	Sulfuric acid	s554

SB	NaBr	Sodium bromide	s239
SDO	SO_2	Sulfur dioxide	s548
SH	NaOH	Sodium hydroxide	s314
SI	NaI	Sodium iodide	s320
SN	$NaNO_3$	Sodium nitrate	s347
SrC	$SrCl_2$	Strontium chloride	s478
ST	NaSCN	Sodium thiocyanate	s441
WA	H_2O	Water	w1
ZB	$ZnBr_2$	Zinc bromide	z15
ZC	$ZnCl_2$	Zinc chloride	z21
ZI		Zeolite	
ZN	$ZnNO_3$	Zinc nitrate	(z48/9)

NS ······ Not specified.

*) Number of inorganic compounds in "Handbook of chemistry and physics, 69ed.," CRC.

1.3 Literature Index

1.3 Literature Index

1.3.1 Material Data

Table 1-5 Literature index of material data for organic compounds

Compound	References	
AA	Eiseman,B.J. (A054)	
Act	Eiseman,B.J. (A054)	
AdN	Eiseman,B.J. (A054)	
AMP	Bokelmann,H. (B033)	
AN	Eiseman,B.J. (A054)	Roberson,J.P. (A167)
	Thieme,A. (A192)	
APN	Eiseman,B.J. (A054)	
BAD	Albright,L.F. (A004)	
n-BDEA	Bokelmann,H. (B033)	
1,4 BDL	Bokelmann,H. (C028)	Dietrich,E. (E032)
	Eiseman,B.J. (A054)	Roberson,J.P. (A167)
2,3 BDL	Roberson,J.P. (A167)	
BDS	Eiseman,B.J. (A054)	
BEHP	Bokelmann,H. (B033)	
BEHA	Bokelmann,H. (B033)	
BEHS	Bokelmann,H. (B033)	

BImi
Subramanyam,N.C. (D169)

BL
Iyoki,S. (B200)
Iyoki,S. (B081)
Iyoki,S. (B083)
Iyoki,S. (D225)
Macriss,R.A. (A117)

Bpy
Bokelmann,H. (B033)

BTr
Iyoki,S. (B203)
Iyoki,S. (B085)
Iyoki,S. (B081)
Iyoki,S. (D225)
Subramanyam,N.C. (D169)

BZL
No Data.

C100
Iyoki,S. (B203)
Iyoki,S. (B085)
Iyoki,S. (B081)
Iyoki,S. (D225)
Iyoki,S. Uemura,T. (B087)

CA
Thieme,A. (A192)

CF
Zellhoeffer,G.F. (A241)

CHN
Bhaduri,S.C. (D193)
Eiseman,B.J. (A054)

DA1
No Data.

DAm
No Data.

DBAd
Bokelmann,H. (B033)

DBAm
Bokelmann,H. (B033)

DBE
Bokelmann,H. (B033)

DoAl
No Data.

DoAm
No Data.

DWA
No Data.

EA
Biermann,W.J. (A023)
Hasaba,S. (B069)
Hasaba,S. (B071)
Uemura,T. (B217)
Uemura,T. (B222)

EAl
Eiseman,B.J. (A054)
Iyoki,S. (B082)
Uemura,T. (B199)

EB
Albright,L.F. (A004)

EEDEG
Roberson,J.P. (A167)

EFA
Thieme,A. (A192)

EG
Biermann,W.J. (A023)
Bokelmann,H. (C028)
Bokelmann,H. (D012)
Boklemann,H. (B036)
Dietrich,E. (E032)
Ehmke,H.J. (D031)
Felli,M. (D191)
Iyoki,S. (B089)
Macriss,R.A. (A117)
Roberson,J.P. (A167)
Uemura,T. (B209)

EiAl
No Data.

EL
Aker,J.E. (A003)
Albright,L,F. (A005)
Albright,L.F. (A006)

ElA
Cheron,J. (D024)

EMPO
Eiseman,B.J. (A054)

EP
  Bokelmann,H. (B033)

EPh
  Eiseman,B.J. (A054)

ES
  Eiseman,B.J. (A054)

ESE
  Eiseman,B.J. (A054)

ETFE
  (C252)
  Bokelmann,H. (C028)
  Bokelmann,H. (B033)
  Gerritsen,H.G. (D046)
  Murphy,K.P. (A136)
  Murphy,K.P. (C137)

FP
  Bokelmann,H. (B033)

GYL
  No Data.

---

n-HA
  Albright,L.F. (A004)
  Albright,L.F. (A006)

HAd
  No Data.

HAl
  Uemura,T. (D219)

HAm
  No Data.

HDAl
  No Data.

HFB
  Meeks,A.C. (C126)

HFIP
  No Data.

Renz,M. (D147)
Renz,M. (D192)
Seher,Dieter (D158)
Steimle,F. (B186)
Uemura,T. (B211)
Uemura,T. (B210)
Uemura,T. (B206)
Uemura,T. (B207)

MD
No Data.

MEA
Bokelmann,H. (B033)

MFAd
Eiseman,B.J. (A054)

MIm
Bokelmann,H. (B033)

MM
Thieme,A. (A192)

MP
Bokelmann,H. (B033)

Nat
Bokelmann,H. (B033)

NB
Albright,L.F. (A006)
Roberson,J.P. (A167)
Thieme,A. (A192)

NMP
Bokelmann,H. (D014)
Bokelmann,H. (C028)
Bokelmann,H. (D015)
Bokelmann,H. (B033)
Bokelmann,H. (D012)
Bokelmann,H. (B035)
Boklemann,H. (C030)
Boklemann,H. (C031)
Boklemann,H. (B036)
Borde,I. (E029)
Dietrich,E. (E032)
Gerritsen,H.G. (D046)

NP
Eiseman,B.J. (A054)

NPAl
Uemura,T. (D219)

OA
Albright,L.F. (A004)

OAl
Kashiwagi,T. (B094)　　Uemura,T. (D219)

OC
Thieme,A. (A192)

OCA
Roberson,J.P. (A167)　　Thieme,A. (A192)

OCN
Albright,L.F. (A004)　　Albright,L.F. (A006)

ODAd
No Data.

ODAl
No Data.

ODAm
No Data.

PAl
Oosako,H. (B142)

PD
No Data.

PDN
Albright,L.F. (A004)

PDS
Roberson,J.P. (A167)

PFP
Meeks,A.C. (C126)　　Rochester,C.H. (C168)

PPA
Rafflenbeul,L. (B161)

PVImi
Eng,F.P. (D042)

Pyr
Bokelmann,H. (B033)

R22

Agarwal,R.S. (D275)
Albright,L.F. (A004)
Ando,E. (B011)
Bhaduri,S.C. (D193)
Bokelmann,H. (C028)
Bokelmann,H. (D012)
Boklemann,H. (C031)
Borde,I. (B236)
Dietrich,E. (E032)
Ehmke,H.J. (D031)
Hölbling,W. (D066)
Jelinek,M. (D267)
Kriebel,M. (C101)
Macriss,R.A. (A117)
Oouchi,T. (B143)
Renz,M. (C163)
Seher,Dieter (D158)
Steimle,F. (B186)
Thieme,A. (A192)
Uemura,T. (B226)
Albright,L,F. (A005)
Ando,E. (B013)
Ando,E. (D188)
Bhaduri,S.C. (D269)
Bokelmann,H. (D015)
Bokelmann,H. (B035)
Boklemann,H. (B036)
Borde,I. (E029)
Dorairaj,S. (D278)
Eiseman,B.J. (A054)
Iedema,P.D. (D070)
Jelinek,M. (C091)
Kueper,P. (C102)
Mastrangelo,S.V.R. (C120)
Podoll,R.T. (A153)
Renz,M. (D147)
Sellerio,U. (B183)
Suzuki,S. (B190)
Tyagi,K.P. (D190)
Uemura,T. (B216)

R30

Bokelmann,H. (B033)
Eiseman,B.J. (A054)

R31

Eiseman,B.J. (A054)
Mastrangelo,S.V.R. (C120)
Macriss,R.A. (A117)

Sul

Bokelmann,H. (B033)
Eiseman,B.J. (A054)

TAN

Albright,L.F. (A004)
Thieme,A. (A192)

TBP

Bokelmann,H. (C028)
Eiseman,B.J. (A054)
Bokelmann,H. (B033)

TCP

Bokelmann,H. (B033)

TDAd

No Data.

TDAl

No Data.

TDAm

No Data.

TMA
Roberson,J.P. (A167)

TMS
No Data.

TMU
Eiseman,B.J. (A054)

TrEG
Bokelmann,H. (B033) Macriss,R.A. (A117)

TrFP
Rochester,C.H. (C168)

VA
Albright,L.F. (A004)

(C252)
Airaksinen,M.M. (C001)
Aker,J.E. (A003)
Albright,L.F. (A004)
Agarwal,R.S. (D275)
Airaksinen,M.M. (C002)
Albright,L,F. (A005)

Table 1-6 Literature index of material data for inorganic compounds

---

AB

Roberson,J.P. (A167)

AI

Roberson,J.P. (A167)

AM

Alefeld,G (D183)
Baud,E. (B016)
Baud,E. (B017)
Biermann,W.J. (A022)
Blytas,G.C. (A026)
Blytas,G.C. (A027)
Bokelmann,H. (C028)
Bokelmann,H. (D015)
Bokelmann,H. (D012)
Boklemann,H. (C031)
Boklemann,H. (B036)
Clifford,I.L. (B045)
Dietrich,E. (E032)
Edwards,T.J. (A051)
Ehmke,H.J. (C052)
Ehmke,H.J. (D031)
Gerritsen,H.G. (D046)
Hölbling,W. (D066)
Iedema,P.D. (D070)
Jain,P.C. (B090)
Kashiwagi,T. (D229)
Kashiwagi,T. (D242)
Macriss,R.A. (A111)
Macriss,R.A. (A116)
Macriss,R.A. (A117)
McLinden,M.O. (D105)
Mollier,H. (B131)
Mollier,H. (B130)
Muehlmann,H.P. (D122)
Niesemeyer,N. (D126)
Perman,E.P. (B149)
Podoll,R.T. (A153)
Polak,J. (A154)
Radermacher, R. (B158)
Radermacher,R. (B160)
Renz,M. (C163)
Renz,M. (D147)
Roberson,J.P. (A167)
Scatchard,G. (A171)
Schulz,S.C.G. (B177)
Seher,Dieter (D158)
Steimle,F. (B186)
Stierlin,H. (C188)
Tyagi,K.P. (D190)
Wucherer,J. (B234)
Ziegler,B. (B244)
Zinner,K. (B245)

CB

No Data.

CC

Dietrich,E. (E032)
Isshiki,N. (B079)
Isshiki,Naotsugu (D073)
Paranjape,D.V. (D132)

CDO

Cheron,J. (D024)

KT

No Data.

LB

Aker,J.E. (A003)
Alefeld,G (D183)
Belherazem,A. (B019)
Biermann,W.J. (A022)
Biermann,W.J. (A023)
Bokelmann,H. (C028)
Boryta,D.A. (A040)
Bunte,H.J. (D020)
Cohen,A. (A046)
Dietrich,E. (E032)

LNT

Blytas,G.C. (A026)
Bokelmann,H. (C028)
Bokelmann,H. (D015)
Bokelmann,H. (D012)
Boklemann,H. (C031)
Boklemann,H. (B036)
Davidson,W.F. (D027)
Dietrich,E. (E032)
Ehmke,H.J. (C052)
Ehmke,H.J. (D031)
Iyoki,S. (B085)
Renz,M. (C163)

LT

Biermann,W.J. (A022)
Blytas,G.C. (A026)
Bokelmann,H. (C028)
Dietrich,E. (E032)
Iedema,P.D. (D070)
Iyoki,S. (B080)
Iyoki,S. (B085)
Kashiwagi,T. (D242)
Koshiyama,H. (B201)
Macriss,R.A. (A114)
Macriss,R.A. (A116)
Macriss,R.A. (A117)

OPA

No Data.

PB

Blytas,G.C. (A026)

PH

Rockenfeller,U (D184)

PN

Davidson,W.F. (D027)

SA

Dietrich,E. (E032)
Hölbling,W. (D066)

SB

Roberson,J.P. (A167)

SDO

Albright,L.F. (A006)
Basu,R.K. (D006)

SH

Dietrich,E. (E032)
Hölbling,W. (D066)
Rockenfeller,U (D184)
Uemura,T. (B221)

SI

Roberson,J.P. (A167)

SN

Blytas,G.C. (A026)
Davidson,W.F. (D027)

ST

WA

1.3.2 Mixture Data of Key Fluids

Table 1-7 List of key fluids

<Ammonia>

Ammonia - Water
Ammonia - Lithium nitrate
Ammonia - Lithium thiocyanate
Ammonia - Sodium thiocyanate
Ammonia - Ammonium iodide
Ammonia - Water / Lithium bromide
Ammonia - Water / Lithium nitrate

<Water>

Water - Lithium bromide
Water - Lithium cloride
Water - Lithium iodide
Water - Lithium bromide / Lithium thiocyanate
Water - Lithium bromide / Lithium cloride
Water - Lithium bromide / Zinc bromide
Water - Lithium bromide / Zinc cloride
Water - Lithium bromide / Ethylene glycol

<Alcohols>

Methanol - Lithium bromide
Methanol - Zinc bromide
Methanol - Lithium cloride
Methanol - Lithium bromide / Zinc bromide
Methanol - Lithium iodide / Zinc bromide
Ethanol - Lithium bromide
TFE - DMETEG
TFE - N-Methyl-2-pyrolidone (NMP)
TFE - Quinoline

<Amines>

Methylamine - Lithium thiocyante
Methylamine - Sodium thiocyanate
Methylamine - Water
Methylamine - Ethylene glycol
Methylamine - Tetraethylene glycol
Methylamine - Water / Lithium bromide
Ethylamine - Water

<HCFCs>

R22 - DMETEG
R22 - DMEDEG
R22 - DMETrEG
R22 - DMF
R22 - IBA
R22 - DMA
R133a - DMETEG
R133a - ETFE
R133a - DMETrEG
R133a - NMP
R123a - DMETEG
R123a - ETFE

Table 1-8 Literature index of key mixtures

*** WORKING FLUIDS ***
Fluid 1 : AM
Fluid 2 : WA

*** Author **********	Data No	******* Category ******
Baud,E.	B016-01	Others
Baud,E.	B017-01	Others
Bokelmann,H.	C028-28	Solubility
Clifford,I.L.	B045-01	PVT-X, Crystallization
Dietrich,E.	E032-04	Heat_pump, COP
Edwards,T.J.	C052-01	PVT-X
Gerritsen,H.G.	D046-01	PVT-X, Heat_pump
Hölbling,W.	D066-01	Heat_pump, COP
Iedema,P.D.	D070-02	COP
Jain,P.C.	B090-01	PVT-X, Enthalpy
Kashiwagi,T.	D229-01	Diffusion_coefficient, Absorber
Macriss,R.A.	A111-01	PVT-X, Enthalpy
McLinden,M.O.	D105-01	Heat_pump, COP
Mollier,H.	B131-01	PVT-X
Mollier,H.	B130-01	Enthalpy
Muehlmann,H.P.	D122-01	Heat_pump, COP
Niesemeyer,N.	D126-01	Others
Perman,E.P.	B149-01	PVT-X
Polak,J.	A154-01	PVT-X
Radermacher, R.	B158-03	PVT-X, Specific_heat Viscosity, Heat_pump
Renz,M.	C163-01	PVT-X
Renz,M.	D147-01	PVT-X
Scatchard,G.	A171-01	PVT-X, Enthalpy
Schulz,S.C.G.	B177-01	PVT-X, Enthalpy
Seher,Dieter	D159-01	Heat_pump, COP
Steimle,F.	B186-02	Heat_pump
Stierlin,H.	C188-01	Refrigerating_machine, COP
Wucherer,J.	B234-01	PVT-X
Ziegler,B.	B244-01	PVT-X, Enthalpy
Zinner,K.	B245-01	Enthalpy

*** WORKING FLUIDS ***
Fluid 1 : AM
Fluid 2 : LNT

*** Author **********	Data No	******* Category ******
Blytas,G.C.	A026-04	PVT-X
Renz,M.	C163-02	PVT-X

*** WORKING FLUIDS ***
Fluid 1 : AM
Fluid 2 : LT

*** Author **********	Data No	******* Category ******
Blytas,G.C.	A026-03	PVT-X, Solubility
Dietrich,E.	E032-16	Heat_pump, COP
Dietrich,E.	E032-20	Heat_pump, COP
Kashiwagi,T.	D242-01	Diffusion_coefficient
Macriss,R.A.		

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*** WORKING FLUIDS ***
  Fluid 1    :  AM
  Fluid 2    :  ST
*** Author ********** Data No ******* Category ******
  Blytas,G.C.            A027-01      PVT-X, Enthalpy
                                      Viscosity, Thermal_conductivity

  Dietrich,E.            E032-19      Heat_pump, COP
  Roberson,J.P.          A167-19      Solubility
```

```
*** WORKING FLUIDS ***
  Fluid 1    :  AM
  Fluid 2    :  AI
*** Author ********** Data No ******* Category ******
  Roberson,J.P.          A167-24      Solubility
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*** WORKING FLUIDS ***
  Fluid 1    :  AM
  Fluid 2    :  WA
  Fluid 3    :  LB
*** Author ********** Data No ******* Category ******
  Alefeld,G              D183-01      PVT-X
  Bokelmann,H.           C028-30      Solubility
  Dietrich,E.            E032-05      Heat_pump, COP
  Ehmke,H.J.             C052-03      Solubility
  Hölbling,W.            D066-04      Heat_pump, COP
  Kashiwagi,T.           D229-02      Diffusion_coefficient, Absorber
  McLinden,M.O.          D105-02      Heat_pump, COP
  Radermacher, R.        B158-01      PVT-X, Specific_heat
                                      Viscosity, Heat_pump

  Radermacher,R.         B160-01      Enthalpy, Heat_pump
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*** WORKING FLUIDS ***
  Fluid 1    :  AM
  Fluid 2    :  WA
  Fluid 3    :  LNT
*** Author ********** Data No ******* Category ******
  Bokelmann,H.           C028-29      Solubility
  Bokelmann,H.           D015-03
  Bokelmann,H.           D012-05      PVT-X, Viscosity
  Boklemann,H.           C031-03      PVT-X
  Boklemann,H.           B036-05      PVT-X, Viscosity
  Dietrich,E.            E032-22      Heat_pump, COP
  Ehmke,H.J.             C052-04      Solubility
  Ehmke,H.J.             D031-02      PVT-X, Solubility
                                      Crystallization, Viscosity
```

*** WORKING FLUIDS ***

Fluid 1 : WA
Fluid 2 : LB

*** Author **********	Data No	******* Category ******
Boryta,D.A.	A040-01	Solubility
Dietrich,E.	E032-12	Heat_pump, COP
Hasaba,S.	B066-01	PVT-X
Hasaba,S.	B067-01	Solubility, Specific_heat
Hasaba,S.	B068-01	Enthalpy, Refrigerating_machine
Hasaba,S.	B072-01	PVT-X, Enthalpy Surface_tension, Viscosity
Hasaba,S.	B073-01	Others, Refrigerating_machine
Herold,K.E.	D279-01	PVT-X
Hölbling,W.	D066-02	Heat_pump, COP
Iedema,P.D.	D070-06	COP
Kashiwagi,T.	B096-01	Diffusion_coefficient
Lange,E	D186-01	Enthalpy, Specific_heat Others
Matsuda,A.	B122-01	PVT-X
McNeely,L.A.	A125-01	PVT-X, Enthalpy
Ogawa,K.	B139-01	Specific_heat
Oouchi,T.	B145-01	PVT-X
Oouchi,T.	B145-02	Enthalpy
Pennington,W.	A148-01	PVT-X
Renz,M.	C163-05	PVT-X
Renz,M.	D147-04	PVT-X
Steimle,F.	B186-01	Heat_pump
Uemura,T.	B217-01	Thermal_conductivity
Uemura,T.	B214-01	PVT-X, Enthalpy Viscosity

*** WORKING FLUIDS ***

Fluid 1 : WA
Fluid 2 : LC

*** Author **********	Data No	******* Category ******
Hasaba,S.	B070-01	PVT-X, Surface_tension Viscosity, Thermal_conductivity
Isshiki,Naotsugu	D073-01	PVT-X, Corrosiveness Others
Uemura,T.	B219-01	Enthalpy, Specific_heat
Uemura,T.	B220-01	Enthalpy, COP
Uemura,T.	B225-01	PVT-X
Uemura,T.	B224-01	Others, Refrigerating_machine
Uemura,T.	B205-01	PVT-X, Enthalpy COP

*** WORKING FLUIDS ***

Fluid 1 : WA
Fluid 2 : LI

*** Author **********	Data No	******* Category ******
Bach,R.O.	D185-01	PVT-X, Crystallization
Hasaba,S.	B212-01	Enthalpy, COP

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*** WORKING FLUIDS ***
  Fluid 1   :  WA
  Fluid 2   :  LB
  Fluid 3   :  LT
*** Author ********** Data No ******* Category ******
  Iyoki,S.             B080-01      Enthalpy, Viscosity
                                    Refrigerating_machine

  Iyoki,S.             B085-01      Corrosiveness
  Iyoki,S.             B085-02      Corrosiveness
  Iyoki,S.             B085-03      Corrosiveness
  Koshiyama,H.         B201-01      PVT-X, Specific_heat
                                    Viscosity

  Macriss,R.A.         A117-03      PVT-X
  Macriss,R.A.         A117-04      Solubility

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*** WORKING FLUIDS ***
  Fluid 1   :  WA
  Fluid 2   :  LB
  Fluid 3   :  LC
*** Author ********** Data No ******* Category ******
  Biermann,W.J.        A022-01      PVT-X, Solubility
  Cohen,A.             A046-01      Corrosiveness
  Hasaba,S.            B067-02      Solubility
  Matsuda,A.           B122-02      PVT-X
  Uemura,T.            B218-01      PVT-X
  Uemura,T.            B213-01      PVT-X, Others

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*** WORKING FLUIDS ***
  Fluid 1   :  WA
  Fluid 2   :  LB
  Fluid 3   :  ZB
*** Author ********** Data No ******* Category ******
  Nakanishi,M.         B202-01      PVT-X, Specific_heat
                                    Viscosity

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*** WORKING FLUIDS ***
  Fluid 1   :  WA
  Fluid 2   :  LB
  Fluid 3   :  ZC
*** Author ********** Data No ******* Category ******
  Iyoki,S.             B195-01      Enthalpy, Refrigerating_machine
                                    COP

  Manago,A.            B119-01      PVT-X, Enthalpy
                                    Viscosity

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*** WORKING FLUIDS ***
  Fluid 1   :  WA
  Fluid 2   :  LB
  Fluid 3   :  EG
*** Author ********** Data No ******* Category ******
  Biermann,W.J.        A023-01      PVT-X, Specific_heat
                                    Crystallization
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Iyoki,S.	B089-01	PVT-X, Solubility Enthalpy
Uemura,T.	B209-01	Specific_heat

*** WORKING FLUIDS ***
Fluid 1 : MAl
Fluid 2 : LB

*** Author **********	Data No	******* Category ******
Bunte,H.J.	D020-01	Others
Eichholz,H.D.	D032-01	PVT-X, Enthalpy
Hölbling,W.	D066-06	Heat_pump, COP
Iedema,P.D.	D070-07	COP
Oosako,H.	B142-02	Solubility, Crystallization
Renz,M.	D147-06	PVT-X
Seher,Dieter	D158-03	Heat_pump, COP
Steimle,F.	B186-04	Heat_pump
Uemura,T.	B211-01	Enthalpy, COP
Uemura,T.	B210-01	PVT-X

*** WORKING FLUIDS ***
Fluid 1 : MAl
Fluid 2 : ZB

*** Author **********	Data No	******* Category ******
Eichholz,H.D.	D032-02	PVT-X, Enthalpy
Renz,M.	D192-01	PVT-X
Uemura,T.	B207-01	PVT-X, Viscosity COP

*** WORKING FLUIDS ***
Fluid 1 : MAl
Fluid 2 : LC

*** Author **********	Data No	******* Category ******
Oosako,H.	B142-01	Solubility, Crystallization

*** WORKING FLUIDS ***
Fluid 1 : MAl
Fluid 2 : LB
Fluid 3 : ZB

*** Author **********	Data No	******* Category ******
Dietrich,E.	E032-14	Heat_pump, COP
Eichholz,H.D.	D032-03	Enthalpy
Girgis,M.M.	D047-01	PVT-X, Solubility Crystallization, Stability
Hasaba,S.	B215-01	PVT-X, Enthalpy Viscosity
Hölbling,W.	D066-07	Heat_pump, COP
Iedema,P.D.	D070-01	Solubility, Enthalpy Viscosity, Diffusion_coefficient
Renz,M.	D192-02	PVT-X, Solubility Viscosity, Others

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  Steimle,F.            B186-05      Heat_pump
  Uemura,T.             B210-02      PVT-X

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*** WORKING FLUIDS ***
  Fluid 1    :  MA1
  Fluid 2    :  LI
  Fluid 3    :  ZB
*** Author ********** Data No ******* Category ******
  Uemura,T.             B206-01      PVT-X, Specific_heat
                                     COP

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*** WORKING FLUIDS ***
  Fluid 1    :  EA1
  Fluid 2    :  LB
*** Author ********** Data No ******* Category ******
  Uemura,T.             B199-01      PVT-X, Viscosity

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*** WORKING FLUIDS ***
  Fluid 1    :  TFE
  Fluid 2    :  DMETEG
*** Author ********** Data No ******* Category ******
  Bokelmann,H.          C028-04      Solubility
  Bokelmann,H.          B033-35      Solubility
  Gerritsen,H.G.        D046-03      PVT-X, Heat_pump
  Rockenfeller,U        D184-03      PVT-X, Enthalpy
                                     Specific_heat, Viscosity
  Seher,D.              B180-01      PVT-X, Heat_pump
  Seher,D.              D157-01      PVT-X, Viscosity
                                     Stability, Heat_pump
  Seher,Dieter          D158-04      Heat_pump, COP

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*** WORKING FLUIDS ***
  Fluid 1    :  TFE
  Fluid 2    :  NMP
*** Author ********** Data No ******* Category ******
  Bokelmann,H.          D014-01      PVT-X, Viscosity
                                     Stability
  Bokelmann,H.          C028-05      PVT-X, Solubility
  Bokelmann,H.          D015-01
  Bokelmann,H.          B033-40      PVT-X, Solubility
                                     Viscosity
  Bokelmann,H.          D012-01      PVT-X, Enthalpy
  Bokelmann,H.          B035-01      Enthalpy
  Boklemann,H.          C030-01      PVT-X, Toxicity
                                     Others
  Boklemann,H.          C031-01      PVT-X, Corrosiveness
                                     Toxicity
  Boklemann,H.          B036-01      PVT-X
  Dietrich,E.           E032-08      Heat_pump, COP
  Gerritsen,H.G.        D046-04      PVT-X, Heat_pump
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*** WORKING FLUIDS ***
  Fluid 1   :  TFE
  Fluid 2   :  QUN
*** Author ********** Data No ******* Category ******
  Bokelmann,H.        C028-02      Solubility, Stability
  Bokelmann,H.        B033-34      Solubility
  Girsberger,W.       B064-01      PVT-X, Solubility
                                   Stability

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*** WORKING FLUIDS ***
  Fluid 1   :  MA
  Fluid 2   :  LT
*** Author ********** Data No ******* Category ******
  Bokelmann,H.        C028-19      Solubility
  Dietrich,E.         E032-15      Heat_pump, COP
  Dietrich,E.         E032-17      Heat_pump, COP
  Iedema,P.D.         D070-03      COP
  Macriss,R.A.        A114-01      PVT-X, Enthalpy
                                   Viscosity

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*** WORKING FLUIDS ***
  Fluid 1   :  MA
  Fluid 2   :  ST
*** Author ********** Data No ******* Category ******
  Macriss,R.A.        A113-01      PVT-X
  Macriss,R.A.        A117-06      COP

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*** WORKING FLUIDS ***
  Fluid 1   :  MA
  Fluid 2   :  WA
*** Author ********** Data No ******* Category ******
  Dietrich,E.         E032-06      Heat_pump, COP
  Felsing,W.A.        C059-01      PVT-X
  Mehl,W.             C127-01      PVT-X
  Renz,M.             C163-03      PVT-X
  Renz,M.             D147-03      PVT-X
  Uemura,T.           B223-01      PVT-X, Enthalpy
                                   COP

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*** WORKING FLUIDS ***
  Fluid 1   :  MA
  Fluid 2   :  EG
*** Author ********** Data No ******* Category ******
  Bokelmann,H.        C028-24      Solubility, Thermal_conductivity
  Bokelmann,H.        C028-25      Solubility
  Bokelmann,H.        D012-03      PVT-X
  Boklemann,H.        B036-03      PVT-X
  Dietrich,E.         E032-03      Heat_pump, COP
  Ehmke,H.J.          D031-01      PVT-X
  Felli,M.            D191-01      PVT-X
  Roberson,J.P.       A167-13      Solubility
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*** WORKING FLUIDS ***

Fluid 1 : MA
Fluid 2 : TEG

*** Author **********	Data No	******* Category ******
Bokelmann,H.	C028-27	Solubility
Roberson,J.P.	A167-16	Solubility

*** WORKING FLUIDS ***

Fluid 1 : MA
Fluid 2 : WA
Fluid 3 : LB

*** Author **********	Data No	******* Category ******
Alefeld,G	D183-02	PVT-X
Bokelmann,H.	C028-20	Solubility, Viscosity Stability
Dietrich,E.	E032-07	Heat_pump, COP
Ehmke,H.J.	C052-01	Solubility
Hölbling,W.	D066-05	Heat_pump, COP
Radermacher, R.	B158-02	PVT-X, Specific_heat Viscosity, Heat_pump
Radermacher,R.	B160-02	Enthalpy, Heat_pump

*** WORKING FLUIDS ***

Fluid 1 : EA
Fluid 2 : WA

*** Author **********	Data No	******* Category ******
Hasaba,S.	B069-01	PVT-X, Enthalpy Specific_heat
Hasaba,S.	B071-01	Surface_tension, Viscosity
Uemura,T.	B217-02	Thermal_conductivity
Uemura,T.	B222-01	PVT-X, Enthalpy COP

*** WORKING FLUIDS ***

Fluid 1 : R22
Fluid 2 : DMETEG

*** Author **********	Data No	******* Category ******
Albright,L,F.	A005-04	Solubility
Albright,L.F.	A004-15	PVT-X, Solubility
Bokelmann,H.	C028-31	Solubility
Dietrich,E.	E032-11	Heat_pump, COP
Ehmke,H.J.	D031-03	PVT-X
Eiseman,B.J.	A054-06	Enthalpy, Stability Refrigerating_machine
Hölbling,W.	D066-03	Heat_pump, COP
Iedema,P.D.	D070-08	COP
Jelinek,M.	C091-01	PVT-X, Enthalpy
Kriebel,M.	C101-01	PVT-X, Solubility Enthalpy, Specific_heat
Macriss,R.A.	A117-07	COP
Mastrangelo,S.V.R.	C120-02	PVT-X, Solubility Heat_pump

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  Oouchi,T.           B143-01      Enthalpy
  Oouchi,T.           B143-02      PVT-X
  Renz,M.             C163-04      PVT-X
  Renz,M.             D147-05      PVT-X
  Seher,Dieter        D158-02      Heat_pump, COP
  Steimle,F.          B186-03      Heat_pump
  Suzuki,S.           B190-01      PVT-X, Viscosity
                                   Others


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*** WORKING FLUIDS ***
  Fluid 1    :  R22
  Fluid 2    :  DMEDEG
*** Author ********** Data No ******* Category ******
  Ando,E.             B011-01      PVT-X, Enthalpy
                                   Specific_heat, Stability
  Ando,E.             D188-01      PVT-X, Enthalpy
                                   Specific_heat


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*** WORKING FLUIDS ***
  Fluid 1    :  R22
  Fluid 2    :  DMETrEG
*** Author ********** Data No ******* Category ******
  Bokelmann,H.        C028-36      Solubility
  Bokelmann,H.        D015-04
  Bokelmann,H.        D012-04      PVT-X, Enthalpy
  Bokelmann,H.        B035-03      Enthalpy
  Boklemann,H.        C031-04      PVT-X
  Boklemann,H.        B036-04      PVT-X
  Ehmke,H.J.          D031-04      PVT-X


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*** WORKING FLUIDS ***
  Fluid 1    :  R22
  Fluid 2    :  DMF
*** Author ********** Data No ******* Category ******
  Agarwal,R.S.        D275-01      PVT-X
  Albright,L,F.       A005-06      Solubility
  Ando,E.             B013-01      PVT-X
  Bhaduri,S.C.        D269-01      PVT-X
  Bokelmann,H.        C028-35      Solubility
  Dorairaj,S.         D278-01      Surface_tension, Viscosity
                                   Thermal_conductivity
  Jelinek,M.          D267-01      PVT-X, Refrigerating_machine
  Thieme,A.           A192-03      Solubility
  Tyagi,K.P.          D190-02      PVT-X
  Uemura,T.           B226-02      PVT-X, Viscosity
                                   Surface_tension, Others
  Uemura,T.           B216-01      PVT-X, Enthalpy
                                   COP


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*** WORKING FLUIDS ***
  Fluid 1    :  R22
  Fluid 2    :  IBA
*** Author ********** Data No ******* Category ******
  Sellerio,U.          B183-01       PVT-X, Refrigerating_machine
  Uemura,T.            B216-02       PVT-X, Enthalpy
                                     COP

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*** WORKING FLUIDS ***
  Fluid 1    :  R22
  Fluid 2    :  DMA
*** Author ********** Data No ******* Category ******
  Albright,L,F.        A005-02       Solubility
  Bhaduri,S.C.         D193-03       PVT-X
  Bhaduri,S.C.         D269-02       PVT-X

---------------------------------------------------------------
*** WORKING FLUIDS ***
  Fluid 1    :  R133a
  Fluid 2    :  DMETEG
*** Author ********** Data No ******* Category ******
  Bokelmann,H.         C028-11       Solubility
  Bokelmann,H.         B033-51       Solubility, Stability

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*** WORKING FLUIDS ***
  Fluid 1    :  R133a
  Fluid 2    :  ETFE
*** Author ********** Data No ******* Category ******
  Bokelmann,H.         C028-13       Solubility
  Bokelmann,H.         B033-52       Solubility
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*** WORKING FLUIDS ***
  Fluid 1    :  R133a
  Fluid 2    :  DMETrEG
*** Author ********** Data No ******* Category ******
  Bokelmann,H.         C028-14       Solubility
  Bokelmann,H.         B033-46       Solubility

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*** WORKING FLUIDS ***
  Fluid 1    :  R133a
  Fluid 2    :  NMP
*** Author ********** Data No ******* Category ******
  Bokelmann,H.         C028-15       Solubility
  Bokelmann,H.         B033-48       Solubility, Stability

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*** WORKING FLUIDS ***
  Fluid 1    :  R123a
  Fluid 2    :  DMETEG
*** Author ********** Data No ******* Category ******
  Bokelmann,H.          D014-02       PVT-X, Viscosity
                                      Stability
  Bokelmann,H.          C028-09       Solubility, Stability
  Bokelmann,H.          D015-02
  Bokelmann,H.          B033-54       PVT-X, Solubility
                                      Stability
  Bokelmann,H.          D012-02       PVT-X, Enthalpy
  Bokelmann,H.          B035-02       Enthalpy
  Boklemann,H.          C031-02       PVT-X, Stability
                                      Toxicity
  Boklemann,H.          B036-02       PVT-X
  Dietrich,E.           E032-09       Heat_pump, COP
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*** WORKING FLUIDS ***
  Fluid 1    :  R123a
  Fluid 2    :  ETFE
*** Author ********** Data No ******* Category ******
                        C252-01       PVT-X, Toxicity
                                      Others
  Bokelmann,H.          B033-56       Solubility
  Gerritsen,H.G.        D046-02       PVT-X, Heat_pump
  Murphy,K.P.           A136-01       PVT-X, Enthalpy
                                      Corrosiveness
  Murphy,K.P.           C137-01       PVT-X, Heat_pump
                                      COP
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1.4 References

1.4.1 References on Physical Properties of Working Fluids

1.4 References

1.4.1 References on Physical Properties of Working Fluids

Author(s):
Title: Absorption Heat Pump System R123a/ETFE Data.
Source: Product Information of Allied Chemical.
Paper No.: C252 Language: English
Reviewer: Japan-A Doc.type: Others(Product Pamphlet)
Comment: Although physical property values are indicated less, since performance measurement is made with a model close to an actual machine, reliability of data appears to be high.

Data No.: C252-01
Fluids: R123a, ETFE
Category: PVT-X, Toxicity
Others
Pressure: 21k～3.4MPa
Temp.: -40～220℃
Conc.: 0～100%

Author(s): Agarwal,R.S. Bapat,S.L.
Title: Solubility characteristics of R22-DMF refrigerant-absorbent combination.
Source: Int. J. Refrig., Vol.8, No.2, 1985, p70-74.
Paper No.: D275 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Measures equilibrium vapor pressure of R22-DMF, and expresses it in terms of P-1/T relations. The gas phase is treated as an ideal solution.

Data No.: D275-01
Fluids: R22, DMF
Category: PVT-X
Pressure: 0.014 - 15.783 bar
Temp.: -25 - 120 C
Conc.: 0 - 100 mass% R22

Author(s): Airaksinen,M.M.
Title: Possible mechanism of toxicity of trilfuoroethanol and other halothane metabolites.
Source: Chem. Abstr., Vol.73, 1970, 75271 e.
Paper No.: C001 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: An abstract of research paper on toxicity of TFE, etc. produced as a metabolite at the time of halothane anesthesia. Isoniazid softens acute toxicity of TFE. The highest toxicity lessening effect is exhibited by ethanol, followed by that of 4-iodo ›yrazole and L-cysteine, in turn.

Data No.: C001-01
Fluids: TFE
Category: Toxicity

Author(s): Airaksinen,M.M.
Title: Toxicity of the metabolites in halothane.
Source: Chem. Abstr., Vol.74, 1971, 110228 r.

Paper No.: C002   Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: 20% of halothane absorbed in the body becomes metabolites, including TFE and trichloroacetic acid in the main. This research probes how these metabolites contribute to the damage which halothane deanesthesizer deals to the muscles.

Data No.: C002-01
Fluids: TFE
Category: Toxicity

Author(s): Aker,J.E. Squires,R.G. Albright,L.F.
Title: An evaluation of alcohol-salt mixtures as absorption refrigeration solutions.
Source: Proceeding of the ASHRAE Semiannual Meeting. Chicago. January 25-28, 1965.
Paper No.: A003   Language: English
Reviewer: Japan-A Doc.type: Conference proceedings
Comment: Although this research is not particularly original, reliability of vapor pressure measurements is high. Contains a certain data on the heat of evaporation of refrigerant, and qualitative descriptions of viscosity and solubility. It also refers to combinations of LiBr and ZnBr2, suggesting that a combination of methanol with LiBr and ZnBr2 (2:1) is promising.

Data No.: A003-01
Fluids: ML, LB
Category: PVT-X, Others
Pressure: 1kPa~96.1kPa
Temp.: 32.2~124.4℃
Conc.: 0.68~0.97 (mass fraction)

Data No.: A003-02
Fluids: ML, LC
Category: PVT-X
Pressure: 5639~78130Pa
Temp.: 35~89.7℃
Conc.: 0.728~0.873 (mass fraction)

Data No.: A003-03
Fluids: ML, ZB
Category: PVT-X, Others
Pressure: 3252~90025Pa
Temp.: 29.9~109.0℃

Data No.: A003-04
Fluids: ML, LB, ZB
Category: PVT-X, Viscosity
Pressure: 2236~81003Pa
Temp.: 54.4~129.4℃
Conc.: 0.357 (mass fraction)

Data No.: A003-05
Fluids: ML, LB, ZB
Category: PVT-X, Viscosity
Others
Pressure: 1236~85220Pa
Temp.: 30~139℃
Conc.: 0.278~0.567 (mass fraction)

Data No.: A003-06
Fluids: ML, LB, ZB
Category: PVT-X, Viscosity
Others
Pressure: 2658~88181Pa
Temp.: 28.8~133.8℃
Conc.: 0.244~0.398 (mass fraction)

Data No.: A003-07
Fluids: ML, LB, LC
Category: PVT-X
Pressure: 3755~78257Pa
Temp.: 30.1~89.7℃
Conc.: 0.678~0.800 (mass fraction)

Data No.: A003-08
Fluids: ML, LC, ZB
Category: PVT-X, Others
Pressure: 2864~101960Pa
Temp.: 30~114.8℃
Conc.: 0.410~0.714 (mass fraction)

Data No.: A003-09
Fluids: EL, LB
Category: PVT-X, Others
Pressure: 1098~89927Pa
Temp.: 35~114.5℃
Conc.: 0.67~0.79(mass fraction)

Data No.: A003-10
Fluids: EL, LB, ZB
Category: PVT-X, Others
Pressure: 1196~87181Pa
Temp.: 55~137.8℃
Conc.: 0.392~0.501(mass fraction)

Author(s): Albright,L,F. Shannon,P.T. Terrier,F. Chueh,P.L.
Title: Solubility of chlorofluoromethanes in nonvolatile polar organic solvents.
Source: AIChE J., Vol.8, No.5, p668-672, November 1962.
Paper No.: A005 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: (1) Data on solubility of R21 and R22 into DMETrEG, DMETEG, DMAA and DMF. Accuracy is 1%. (2) The solubility ranking on the mol basis is DMETEG>DMETrEG>DMAA>DMF. On the mass basis, the ranking reverses.

Data No.: A005-01
Fluids: R21, DMETrEG
Category: Solubility
Pressure: 0.15~6.47bar
Temp.: 20~100.8℃
Conc.: 25~85mol%(R21)

Data No.: A005-02
Fluids: R22, DMA
Category: Solubility
Pressure: 0.64~19.7bar

Temp.: 20～100.8℃
Conc.: 25～73mol%(R22)

Data No.: A005-03
Fluids: R21, DMETEG
Category: Solubility
Pressure: 0.09～0.89bar
Temp.: 37.8～107.2℃
Conc.: 15～18mol%(R21)

Data No.: A005-04
Fluids: R22, DMETEG
Category: Solubility
Pressure: 0.28～1.39bar
Temp.: 37.8～107.2℃
Conc.: 7.68～9.37mol%(R22)

Data No.: A005-05
Fluids: R21, DMF
Category: Solubility
Pressure: 0.11～1.15bar
Temp.: 37.8～107.2℃
Conc.: 10.1～12.8mol%(R21)

Data No.: A005-06
Fluids: R22, DMF
Category: Solubility
Pressure: 0.46～1.98bar
Temp.: 37.8～107.2℃
Conc.: 6.74～7.76mol%(R22)

Data No.: A005-07
Fluids: R21, EL
Category: Solubility
Pressure: 0.29～1.86bar
Temp.: 37.8～107.2℃
Conc.: 21.5～40.5mol%(R21)

Data No.: A005-09
Fluids: R21, DEAP
Category: Solubility
Pressure: 0.25～1.55bar
Temp.: 37.8～107.2℃
Conc.: 22.7～23.9mol%(R21)

Data No.: A005-08
Fluids: R21, DEO
Category: Solubility
Pressure: 0.23～1.47bar
Temp.: 37.8～107.2℃
Conc.: 17.2～18.0mol%(R21)

Author(s): Albright,L.F. Buclez,P.C. Pluche,C.R.
Doody,T.C.
Title: Solubility of refrigerants 11, 21, and 22 in organic solvents containing an oxygen atom.
Source: ASHRAE Trans., Vol.66, p423-433, 1960.
Paper No.: A004 Language: English
Reviewer: Japan-J Doc.type: Journal

Comment: (1) Experimented with solubility of 19 types of organic solvent into R11, R21 and R22. (2) Solubility of DMETEG into R21 and R22 was the highest.

Data No.: A004-01
Fluids: R11, DMETEG
Category: PVT-X, Solubility
Pressure: (0)~6.2bar
Temp.: 23.9~121℃

Data No.: A004-02
Fluids: R21, DEAP
Category: PVT-X, Solubility
Pressure: (0)~6.2bar
Temp.: 23.9~93.3℃

Data No.: A004-03
Fluids: R22, TAN
Category: PVT-X, Solubility
Pressure: (0)~21bar
Temp.: 23.9~121℃

Data No.: A004-04
Fluids: R22, n-HA
Category: PVT-X, Solubility
Temp.: 51.7℃

Data No.: A004-05
Fluids: R22, EB
Category: PVT-X, Solubility
Temp.: 51.7℃

Data No.: A004-06
Fluids: R22, DEM
Category: PVT-X, Solubility
Pressure: 51.7℃

Data No.: A004-07
Fluids: R22, TAN
Category: PVT-X, Solubility
Temp.: 51.7℃

Data No.: A004-08
Fluids: R21, LLA
Category: PVT-X, Solubility
Pressure: 37.8℃

Data No.: A004-09
Fluids: R21, OA
Category: PVT-X, Solubility
Temp.: 37.8℃

Data No.: A004-10
Fluids: R21, VA
Category: PVT-X, Solubility
Temp.: 37.8℃

Data No.: A004-11
Fluids: R21, DMETEG
Category: PVT-X, Solubility
Temp.: 37.8℃

Data No.: A004-12
Fluids: R21, OCN
Category: PVT-X, Solubility
Temp.: 37.8℃

Data No.: A004-13
Fluids: R21, PDN
Category: PVT-X, Solubility
Temp.: 37.8℃

Data No.: A004-14
Fluids: R21, BAD
Category: PVT-X, Solubility
Temp.: 37.8℃

Data No.: A004-15
Fluids: R22, DMETEG
Category: PVT-X, Solubility
Pressure: (0)～22bar
Temp.: 23.9～121℃

Author(s): Albright,L.F. Shannon,P.T. Terrier,F.
Yu,S.N. Chueh,P.L.
Title: Solubility of sulfur dioxide in polar organic solvents.
Source: Chem. Eng. Prog. Symp. Ser., Vol.59, No.44, p66-74, 1963.
Paper No.: A006 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: (1) Accuracy : temperature ± 0.17℃ , pressure ± 0.014～0.034 bar, concentration ±0.01mol%. (2) Although sulfur dioxide has no hydrogen atoms, its sulfur atoms have strong polarity, featuring bonding similar to hydrogen. (3) DMETEG, DMF and DMA are high in solubility.

Data No.: A006-01
Fluids: SDO, DMETEG
Category: PVT-X, Solubility
Enthalpy
Pressure: 0.042～20.31bar
Temp.: 25～93℃

Data No.: A006-02
Fluids: SDO, DMF
Category: PVT-X, Solubility
Enthalpy
Pressure: 0.096～18.73bar
Temp.: 25～93℃

Data No.: A006-03
Fluids: SDO, DMA
Category: PVT-X, Solubility
Enthalpy
Pressure: 0.021～14.5bar
Temp.: 25～93℃

Data No.: A006-04
Fluids: SDO, OCN
Category: PVT-X, Solubility
Pressure: 1.14～19.44bar
Temp.: 25～93℃

Data No.: A006-05
Fluids: SDO, EL
Category: PVT-X, Solubility
Pressure: 1.45～19.55bar
Temp.: 25～93℃

Data No.: A006-06
Fluids: SDO, NB
Category: PVT-X, Solubility
Pressure: 1.32～19.87bar
Temp.: 25～93℃

Data No.: A006-07
Fluids: SDO, n-HA
Category: PVT-X, Solubility
Pressure: 2.04～20.13bar
Temp.: 25～93℃

Author(s): Albright,L.F.
Title: Suggested approach to development of improved absorption working pairs.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C253 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings
Comment: Hydrogen fluoride, though it involves danger, is desirable as refrigerant for absorption refrigerating machines, since it is relatively small in molecular weight and high in both refrigerant vapor pressure and latent heat. Binary refrigerant of ammonia and hydrogen fluoride should be examined.

Author(s): Alefeld,G
Title: Working fluid combinations for absorption heat pumps.
Source: Thermochem. Energy Storage, 1980, P341.
Paper No.: D183 Language:
Reviewer: Japan-A Doc.type: Journal
Comment: When organic system or water is used as absorbent, absorbent evaporates together with part of refrigerant at the time of generation. To prevent it, a rectifier has so far been provided. This, however, results in increased cost of equipment. In order to eliminate the drawback, an attempt has been made to lower the partial pressure of vapor by using mixed refrigerant. As an example, TVX chart of NH3-H2O/LiBr or CH3NH2-H2O/LiBr was drawn. Accuracy, etc. remain unknown, since measurements, etc. are not described in full detail.

Data No.: D183-01
Fluids: AM, WA, LB
Category: PVT-X
Pressure: 1～30bar
Temp.: -30～ 300℃
Conc.: 0～ 100%

Data No.: D183-02
Fluids: MA, WA, LB
Category: PVT-X

Pressure: 1~30bar
Temp.: -10~ 300℃
Conc.: 0~ 100%

Author(s): Alefeld,G.
Title: Minority vote on selection criteria for working fluids to be used inabsorption heat pumps.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C278 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings
Comment: (1)Although the latent heat of evaporation of working medium in terms of kcal/kg is used as the basis for selection, it is better to base selection on kcal/mol. (2)The drawbacks of organic medium lie not in its weight, but in the following characteristics: a)the molecular weight of absorbent increases, according as the specific heat increases; b)the ratio of specific heat to latent heat of vaporization per one mol of absorbent increases ;c)poor thermal stability. (3)In the case of a heat pump in continuous operation, one mol of working fluid is put to one million times of temperature/pressure cycle. Test should be primarily carried out in this this condition.

Author(s): Alefled,G.
Title: Research and development work on heat transformation and heat storage by absorption processes.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C254 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings
Comment: When a heat pump for heating, cooling and heating/cooling is put in intermittent operation, a heat storage unit is necessary. Actually, a heat pump, 10kWh in heat storage capacity, has been operated for two years.

Author(s): Allen,R.A.
Title: Organic absorption gas-fired residential heat pump.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C255 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings
Comment: A performance test on ordinary residential heat pump showed that, due to incomplete defrosting, temperature of heat transfer surface of outdoor coil dropped a little.

Author(s): Anderson,P.
Title: Search for a new refrigerant-absorbent pair for air cooled absorption air conditioner.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C256 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings
Comment: (1) A ternary mixture of bromide, chloride and thiocyanate gives the greatest lowering of the crystallization temperature, although it is not yet enough. (2) As an

additive to bromide solution, ethylene glycol had a favorable effect upon the drop of crystallization temperature, but is not enough in practical applicability to an actual machine, since viscosity of solution rises.

Author(s): Ando,E. Takesita,I.
Title: R22-DMFの蒸気圧
Title Eng: Vapor pressure of R22-DMF.
Source: 第16回空調・冷凍講演会講演論文集; Proc. 16th Air-Cond. Refrig. Conf. Japan, 1982, p109-112.
Paper No.: B013 Language: Japanese
Reviewer: Japan-J Doc.type: Conference proceedings
Comment: By measuring the vapor pressure of R22-DMF system, a correlation equation was formulated. Data within the experimental range were obtained.

Data No.: B013-01
Fluids: R22, DMF
Category: PVT-X
Temp.: -40～140℃

Author(s): Ando,E. Takesita,I.
Title: 吸収式作動媒体R22-DEGDME
Title Eng: Refrigerant-absorbent pair R22-DEGDME.
Source: National technical Report, Vol.29, No.1, Feb. 1983.
Paper No.: B011 Language: Japanese
Reviewer: Japan-J Doc.type: Report
Comment: (1) As working medium for an air-sourced heat pump, R22-DMEDEG was selected. Mainly, thermal stability and solubility were evaluated. (2) Vapor pressure chart and enthalpy-concentration chart of R22-DMEDEG are shown.

Data No.: B011-01
Fluids: R22, DMEDEG
Category: PVT-X, Enthalpy
Specific_heat, Stability
Pressure: vapor pressure:0.1～29.4bar
Temp.: vapor pressure:-20～ 190℃, specific heat: -30～ 110℃, heat of mixing: 10℃
Conc.: vapor pressure:0.1～1(mole fraction of R22), speciific heat: 0～1(mole fraction)

Author(s): Ando,E. Takeshita,I.
Title: Residential gas-fired absorption heat pump based on R22-DEGDME pair. Part 1, Thermodynamic properties of the R22-DEGDME pair.
Source: Int. J. Refrig., Vol.7, No.3, 1984, P181-185.
Paper No.: D188 Language: English
Reviewer: Japan-C Doc.type: Journal
Comment: (1) As the best working med.ums for residential gas-fired absorption heat pump, R22-DEGDME was selected. (2) Temperature-Vapor pressure and temperature-specific heat relations of R22-DEGDME were measured, and it was found that these relations agree well with the results of calculation made according to Rankin or Kerchhoff equation. Mixed heat of R22-DEGDME can be calculated by

Redlich-Kister polynomial expression. (3) From these, P-T-X chart and enthalpy-X chart of R22-DEGDME were shown.

Data No.: D188-01
Fluids: R22, DMEDEG
Category: PVT-X, Enthalpy
Specific_heat
Pressure: 0.1~50kg/cm2(PVT)
Temp.: -20~ 200℃(PVT), -40~ 110℃(Specific heat)
Conc.: R22:20~ 100%(PVT), 0~ 100%(Specific heat)

Author(s): Bach,R.O. Boardman,W.W.Jr.
Title: Vapor pressure of aqueous lithium iodide solution.
Source: ASHRAE J., Vol.9, No.11, 1967, P33-36.
Paper No.: D185 Language: English
Reviewer: Japan-F Doc.type: Journal
Comment: No data on high pressure (near the boiling point). Less than 100 mmHg. Accordingly, accuracy of A and B in logP=A+B/T is limited to a narrow range.

Data No.: D185-01
Fluids: WA, LI
Category: PVT-X, Crystallization
Pressure: 3~30mmHg
Temp.: 34~ 127℃
Conc.: 62.6~80.4%

Author(s): Badarinarayana,k. Murthy,s.s. Murthy,M.V.K.
Title: Thermodynamic analysis of R21-DMF vapor absorption refrigeration systems for solar energy applications.
Source: International Journal of Refrigeration., Vol.5, No.2, March 1982, 115-119.
Paper No.: B015 Language: English
Reviewer: Japan-E Doc.type: Journal
Comment: When performing refrigeration (-5~20℃), on conditions that the machine can be driven with a lower generator temperature, and that COP is high, the results of tentative calculation showed that R21-DMF system is more favorable than R22-DMF system. Thus, a very interesting conclusion has been reached. Comparison with ammonia- water system is desirable.

Data No.: B015-01
Fluids: R21, DMF
Category: Enthalpy, Refrigerating_machine
COP

Author(s): Baehr,H.D.
Title: Summary of research activities in the field of absorption heat pump.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C257 Language: English
Reviewer: Japan-B Doc.type: Conference proceedins
Comment: Experiment with and theoretical research on CH3OH-LiBr-ZnBr2.

Author(s): Barband,J.C. Franc,J.P. Truyol,A.
Flonette,M. Valognes,D.
Title: Chauffage individuel par pompe à chaleur à absorption alimentée au gaz.
Source: Revue Generale de Thermique, Vol.20, 1981, 601-627.
Paper No.: C018 Language: French
Reviewer: Japan-H Doc.type: Report
Comment: It is interesting that this paper describes the selection criteria for optimum combination of working mediums. Examining thermodynamic, safety, technological and economic criteria, this paper has significant contents.

Author(s): Barbaud,J.C. Franc,J.P. Truyol,A.
Florette,M. Valognes,D.
Title: Chauffage individuel par pompe à chaleur absorption alimentée au gaz.
Title Eng: Individual heating with gas alimented absorption heat pump.
Source: Revue Generale de Thermique, aout-septembre, (Nr. 236-237), p.601-627, 1981.
Paper No.: E041 Language: French
Reviewer: Belgium Doc.type:
Comment: Some data is listed in a qualitative way about a number of fluids but all taken from existing literature. No new data is presented.

Author(s): Basu,R.K. Dutta,B.K.
Title: Kinetics of absorption of sulfur dioxide in dimethylaniline solution.
Source: Can. J. Chem. Eng. (Canada), vol.65, no.1, P.27-35, Feb. 1987.
Paper No.: D006 Language: English
Reviewer: Japan-F Doc.type: Journal
Comment: Since this is a literature concerning of sulfur dioxide, its contents appear to be less related to refrigeration.

Data No.: D006-01
Fluids: SDO, DMAm
Category: Others
Pressure: Atmospheric pressure
Temp.: 32,37,42℃
Conc.: SO_2:0～4 vol%; DMA:0.2～0.8 gmole/lit(kerosene)

Author(s): Baud,E. Gay,L.
Title: Détermination des hydrates, en solution, par la méthode thermique. Application au système eau-ammoniac liquide.
Title Eng: Determination of hydrates in solution by a thermodynamic method. Application to the system of water-ammonia liquid.
Source: Ann. Chim. Phs., Vol.17, 398-418, 1909.
Paper No.: B016 Language: French
Reviewer: Japan-A Doc.type: Others
Comment: Although this literature is very old, it contains theoretical considerations and seems to be very high in accuracy of experiment. At present, however, since the enthalpy chart for water-ammonia system is established, the heat of solution will be directly used on less occasions.

Data No.: B016-01
Fluids: AM, WA
Category: Others
Conc.: 18~80.34%

Author(s): Baud,E. Gay,L.
Title: Etude du système eau-ammoniac liquide. Concordance des résultats avec l'hypothèse de l'hydrate d'ammonium.
Title Eng: Study of H2O-NH3 liquid system. Accordance of the result with the hypothesis of the hydrate of ammonium.
Source: Academie des sciences, Seance du 17 mai 1909.
Paper No.: B017 Language: French
Reviewer: Japan-A Doc.type: Others
Comment: A summary of the Paper No. B-016.

Data No.: B017-01
Fluids: AM, WA
Category: Others
Conc.: 18.00~80.34%

Author(s): Belherazem,A. Daams,H.J. Knoche,K.F. Stehmeier,D.
Title: Research activities on absorption heat pumps at the RWTH Aachen.
Source: New Working Pairs For Absorption Processes. Proceedings of a Workshop in Berlin., April 14-16, 1982, P.123-126.
Paper No.: B019 Language: English
Reviewer: Japan-G Doc.type: Conference proceedings
Comment: Carried out measurement of vapor pressure of methanol-lithium bromide solutions in the high temperature region. Enthalpy-concentration diagram is shown. This paper also introduces a method for measuring methanol vapor density by means of Raman spectroscopy.

Data No.: B019-01
Fluids: ML, LB
Category: PVT-X, Enthalpy
Stability
Pressure: PVTx:10kPa~3MPa; enthalpy:500Pa~1MPa
Temp.: PVTx:300K~500K; enthalpy:250~450K
Conc.: 0~55 wt%(Absorbent)

Author(s): Belherazen,A. Daams,H.J. Knoche,K.F. Stemeier,D.
Title: Research activities on absorption heat pumps at the RWTH Aachen.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C265 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings

Author(s): Bertocchio,R.
Title: Couples hydrocarbures-chlorofluores-solvants organiques.
Title Eng: Combination of hydrocarbons, chlorofluoros and organic solvents.

Source: Rencontre experts absorption, Paris, 20-22 mors 1985
Paper No.: B020 Language: French
Reviewer: Japan-B Doc.type: Conference proceedigs
Comment: Gives a general account of CFC-organic solvent system as a refrigerant-absorbent pair. Results for solubility of pairs of R134, R134a, R124, R133a with NMP, as well as pairs of R133a, R123 with DMETEG, are given.

Author(s): Bhaduri,S.C. Verma,H.K.
Title: P-T-X behavior of refrigerant - absorbent pairs.
Source: Int. J. Refrig., Vol.8, No.3, 1985, P172-176.
Paper No.: D193 Language: English
Reviewer: Japan-C Doc.type: Journal
Comment: (1) Carried out experiment with four combinations between refrigerants R12 and R22 and absorbents N-N dimethyl acetamide, and cyclohexanone, and formulated an equation for P-T-X relations. (2) As a result, it was found that R22-N-N dimethyl acetamide and R22-cyclohexanone combinations are suitable for working fluids for absorption refrigerating machines.

Data No.: D193-01
Fluids: R12, DMA
Category: PVT-X
Pressure: 1～17bar
Temp.: 25～90℃
Conc.: 0.046～0.421(mole fraction of R12)

Data No.: D193-02
Fluids: R12, CHN
Category: PVT-X
Pressure: 1～15bar
Conc.: 0.055～0.331 (mole fraction of R12)

Data No.: D193-03
Fluids: R22, DMA
Category: PVT-X
Pressure: 1～13bar
Conc.: 0.1604～0.4918 (mole fraction of R22)

Data No.: D193-04
Fluids: R22, CHN
Category: PVT-X
Pressure: 1～14bar
Conc.: 0.1717～0.4523 (mole fraction of R22)

Author(s): Bhaduri,S.C. Verma,H.K.
Title: Thermodynamic properties of refrigerant-absorbent pairs.
Source: J. Solar Energy Eng., Trans. ASME, Vol.109, Feb. 1987, p58-62.
Paper No.: D269 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Proposes a modified to apply Scotchard-Hildebrand theory to polar molecules, and by calculating the excess enthalpy and vapor pressure therefrom, shows that the results agree well with conventional experimental values. There are two types of refrigerant combination: R22-DMF and R22-DMA.

Data No.: D269-01
Fluids: R22, DMF
Category: PVT-X

Data No.: D269-02
Fluids: R22, DMA
Category: PVT-X

Author(s): Biermann,W.J.
Title: Candidate chemical systems for air cooled, solar powered, absorption air conditioner design, part2-solid absorbents, high latent heat refrigerants.
Source: Technical report of energy systems division of Carrier Corp. April 1978.
Paper No.: A022 Language: English
Reviewer: Japan-G Doc.type: Report
Comment: Reviewed the working mediums for air cooled, solar driven, absorption machine which are hard to crystallize and have a large latent heat of vaporization. (1) $LiClO_3/LiBr-H_2O$: potential as a substitute combination. (2) $LiBr-ZnBr_2$-Methanol: must be reexamined. (3) LiCNS-Ammonia/Methylamine: problematical in long-range chemical stability.

Data No.: A022-01
Fluids: WA, LCT, LB
Category: PVT-X, Solubility
Temp.: 10~150℃
Conc.: 60~85 wt%(Absorbent)

Data No.: A022-02
Fluids: ML, LB, ZB
Category: PVT-X, Solubility
Temp.: 0~150℃
Conc.: 45~75 wt%(Absorbent)

Data No.: A022-03
Fluids: AM, MA, LT
Category: PVT-X, Solubility
Temp.: 20~150℃(AM), 30~120℃(MA)
Conc.: 35~52 wt%(AM)(Absorbent), 45.5~58.7 wt%(MA)(Absorbent)

Author(s): Biermann,W.J.
Title: Candidate chemical systems for air cooled, solar powered, absorption air conditioner design, part3-lithium salts with anti-freeze additives.
Source: Technical report of energy systems division of Carrier Corp. June 1978.
Paper No.: A023 Language: English
Reviewer: Japan-G Doc.type: Report
Comment: As additives suitable for lowering the crystallization temperature of LiBr-water system, two candidates, ethylene glycol and ethylamin, were selected by screening. By comparing the characteristics of these two additives, such as crystallization temperature and heat transfer

performance, ethylene glycol was found to be better. An optimum quantity of ethylene glycol to be added is about 4.5 in terms of LiBr/ethylene glycol ratio. When applied to an air- cooled absorption refrigerating machine, 0.7 of COP was obtained by calculation.

Data No.: A023-01
Fluids: WA, LB, EG
Category: PVT-X, Specific_heat
Crystallization
Temp.: 20～150℃
Conc.: 60～80 wt%(Absorbent)

Data No.: A023-02
Fluids: WA, LB, EA
Category: PVT-X, Specific_heat
Crystallization
Temp.: 20～150℃
Conc.: 60～80 wt%(Absorbent)

Author(s): Blake,D.A. Cascorbi,H.F. Rozoan,R.S. Meyer,F.S.
Title: Animal toxicity of 2,2,2-trifluoroethanol.
Source: Toxicology and Applied Pharmacology, Vol.15, 1969, p83-91.
Paper No.: C024 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Toxicity of TFE, which is known as an anesthetic metabolite, was studied by using mice and dogs. In mice, the acute LD50 was 350mg/kg by the oral or intraperitoneal route and 1.6ml/100ml after a 10 minutes inhalation. Since ethanol prevents oxidation of TFE in the body, it can lower the toxicity of TFE.

Data No.: C024-01
Fluids: TFE
Category: Toxicity

Author(s): Blomberg,P.E.
Title: Points of view on new absorption working pairs and on domestic heat pumps from AB Electrolux.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C258 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings
Comment: Since toxicity of ammonia becomes a problem when used as a working fluid, research on other fluids is being carried out. However, it is still necessary to study the possibilities of minimizing addition of ammonia, while maximizing its effect.

Author(s): Blytas,G.C. Kertesz,D.J. Daniels,F.
Title: Concentrated solutions in liquid ammonia: solubility of NaNO3 and KBr and other salts; vapor pressure of LiNO3-NH3 solutions.
Source: J. Am. Chem. Soc., Vol.84, No.6, p1083-1085, 1962, April 5.
Paper No.: A026 Language: English
Reviewer: Japan-J Doc.type: Journal

Comment: (1) Solubility of negative ions into ammonia is high in the order of SCN->I->Br-. NO3- is highly soluble when strong ions, such as NH4+, Li4+ and Na+, coexist.

Data No.: A026-01
Fluids: AM, SN
Category: PVT-X, Solubility
Temp.: -80~100℃

Data No.: A026-02
Fluids: AM, PB
Category: PVT-X, Solubility
Temp.: -80~40℃

Data No.: A026-03
Fluids: AM, LT
Category: PVT-X, Solubility
Temp.: -75~20℃

Data No.: A026-04
Fluids: AM, LNT
Category: PVT-X
Temp.: -10~135℃
Conc.: 100~32.6wt%(NH3)

Author(s): Blytas,G.C. Daniels,F.
Title: Concentrated solution of NaSCN in liquid ammonia. Solubility, density, vapor pressure, viscosity, thermal conductance, heat of solution and heat capacity.
Source: J. Am. Chem. Soc., Vol.84, No.7, p1075-1082, 1962 April 5.
Paper No.: A027 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: (1) A phase diagram, density data, partial molar volume data, vapor pressure data, viscosity data and thermal conductivity data are provided. (2) Highly soluble.

Data No.: A027-01
Fluids: AM, ST
Category: PVT-X, Enthalpy
Viscosity, Thermal_conductivity
Temp.: -60~100℃

Author(s): Bokelmann,H Renz,M
Title: Working fluid for a sorption heat pump.
Source: Proc. Four Contr. Meeting of Heat Pump, 1982.
Paper No.: D182 Language:
Reviewer: Japan-J Doc.type: Report, Conference
Comment: A future prospect of new working fluids is described. As a result of preliminary examination, methanol-LiBr-ZnBr2(1:1), TFE-HMPT system, TFE-quinoline system, methyl amine-LiSCN system, methyl amine-LiBr/H2O system and methyl amine-glycerol system were found to be promising. Diagrams and tables are almost the same as those contained in order literatures.

Author(s): Bokelmann,H.
Title: Auswahl, Messung thermophysikalischer Eigenschaften und

Beurteilung der Eignung von Niederdruck-Stoffsystemen für Absorptionswärmepumpen.

Title Eng: Selection measurements of thermophysical properties and efficiency assessment of low-pressure working fluids for absorption heat pumps.

Source: Forschungsbericht Nr.12. Deutscher Kälte- und Klimatechnischer Verein e.V., 19 Oct. 1984, 142p.

Corp_src: Deutscher Kaelte- und Klimatechnischer Verein e.V., Stuttgart (Germany,F.R.) ;Essen Univ. (Gesamthochschule) (Germany,F.R.). Fachbereich Energie-, Verfahrens- und Elektrotechnik(9201842; 9200746)

Paper No.: D014 Language: German

Reviewer: Germany Doc.type: Dissertation

Data No.: D014-01

Fluids: TFE, NMP

Category: PVT-X, Viscosity
Stability

Pressure: P:1-915 mbar, density: 1 bar, viscosity: 1 bar

Temp.: P:-20 - 200 ℃, density:20-90 ℃, viscosity: 10-80℃, sta bility:160,170,200℃

Conc.: P:0-1, density:0-0.4, viscosity: 0-0.4 (mole fraction)

Memo1: stability: duration 21 days (160C); 71days (170C); 14days (200C)

Data No.: D014-02

Fluids: R123a, DMETEG

Category: PVT-X, Viscosity
Stability

Pressure: P:50-5000 mbar

Temp.: P:-20 - 200 ℃, density: 20-90 ℃, viscosity: 10-90 ℃, s tability: 160, 180 ℃

Conc.: P: 0-1, density: 0-0.5, viscosity: 0-0.8 (mole fraction) , stability: 0.29, 0.2, 0.19 (mass fraction)

Author(s): Bokelmann,H. Ehmke,H.J. Renz,M. Steimle,F.

Title: Investigations of working fluids for gas-fired absorption plants.

Source: International Gas Research Conference. London 14.-16. Juli 1983, veroffentlicht von Governmant Institutes Inc., Rockville USA. 1983.

Paper No.: C028 Language: English

Reviewer: Japan-C Doc.type: Conference proceedings

Comment: Containing part of a series of studies at Essen Univ., this paper gives a general account of selection of new working fluids with TFE, R123a, R133a, CH3- NH2, NH3 or R22 as refrigerant.

Data No.: C028-01

Fluids: TFE, HMPT

Category: Solubility, Stability

Temp.: 0℃(refrigerant),20~80℃(absorbent); 50℃(refrigerant), 70~ 150℃(absorbent)

Data No.: C028-02

Fluids: TFE, QUN

Category: Solubility, Stability

Temp.: 0℃(refrigerant),20~80℃(absorbent)

Data No.: C028-03
Fluids: TFE, TEG
Category: Solubility
Temp.: 0℃(refrigerant),20~80℃(absorbent); 50℃(refrigerant), 20~80℃(absorbent)

Data No.: C028-04
Fluids: TFE, DMETEG
Category: Solubility
Temp.: 0℃(refrigerant),20~80℃(absorbent); 50℃(refrigerant), 70~ 150℃(absorbent)

Data No.: C028-05
Fluids: TFE, NMP
Category: PVT-X, Solubility
Temp.: 0℃(absorbent),20~70℃(absorbent); 50℃(refrigerant),70 ~ 150℃(absorbent)
Conc.: PTX:35~80%

Data No.: C028-06
Fluids: TFE,_ DMETrEG
Category: Solubility, Stability
Temp.: 0℃(refrigerant); 30~70℃(absorbent)

Data No.: C028-07
Fluids: TFE, TBP
Category: Solubility
Temp.: 0℃(refrigerant); 30~70℃(absorbent)

Data No.: C028-08
Fluids: TFE, IQUN
Category: Solubility, Stability
Temp.: 0℃(refrigerant); 30~80℃(absorbent)

Data No.: C028-09
Fluids: R123a, DMETEG
Category: Solubility, Stability
Temp.: 0℃(refrigernat); 20~80℃(absorbent)

Data No.: C028-10
Fluids: R123a, DMETrEG
Category: Solubility, Stability
Temp.: 0℃(refrigerant); 30~80℃(absorbent)

Data No.: C028-11
Fluids: R133a, DMETEG
Category: Solubility
Temp.: 0℃(refrigerant); 30~80℃(absorbent)

Data No.: C028-12
Fluids: R133a, HMPT
Category: Solubility
Temp.: 0℃(refrigerant); 30~80℃(absorbent)

Data No.: C028-13
Fluids: R133a, ETFE
Category: Solubility
Temp.: 0℃(refrigerant); 30~80℃(absorbent)

Data No.: C028-14

Fluids: R133a, DMETrEG
Category: Solubility
Temp.: 0℃(refrigerant); 30～70℃(absorbent)

Data No.: C028-15
Fluids: R133a, NMP
Category: Solubility
Temp.: 0℃(refrigerant); 30～70℃(absorbent)

Data No.: C028-16
Fluids: R133a, TBP
Category: Solubility
Temp.: 0℃(refrigerant); 30～70℃(absorbent)

Data No.: C028-17
Fluids: R133a, DMF
Category: Solubility, Stability
Temp.: 0℃(refrigerant); 30～70℃(absorbent)

Data No.: C028-18
Fluids: R133a, DEF
Category: Solubility, Stability
Temp.: 0℃(refrigerant); 20～70℃(absorbent)

Data No.: C028-19
Fluids: MA, LT
Category: Solubility
Temp.: -10℃(refrigerant); 20～60℃(absorbent)

Data No.: C028-20
Fluids: MA, LB, WA
Category: Solubility, Viscosity
Stability
Temp.: -10℃(refrigerant); 20～60℃(absorbent)

Data No.: C028-21
Fluids: MA, LNT, WA
Category: Solubility, Stability
Temp.: -10℃(refrigerant); 20～60℃(absorbent)

Data No.: C028-22
Fluids: MA, AM, WA
Category: Solubility
Temp.: -10℃(refrigerant); 20～60℃(absosrbent)

Data No.: C028-23
Fluids: MA, LNT, EG
Category: Solubility
Temp.: -10℃(refrigerant); 30～60℃(absorbent)

Data No.: C028-24
Fluids: MA, EG
Category: Solubility, Thermal_conductivity
Temp.: -10℃(refrigerant); 30～60℃(absorbent)

Data No.: C028-25
Fluids: MA, EG
Category: Solubility
Temp.: -10℃(refrigerant); 25～60℃(absorbent)

Data No.: C028-26
Fluids: MA, 1,4 BDL
Category: Solubility
Temp.: -10℃(refrigerant); 25~60℃(absorbent)

Data No.: C028-27
Fluids: MA, TEG
Category: Solubility
Temp.: -10℃(refrigerant); 25~60℃(absorbent)

Data No.: C028-28
Fluids: AM, WA
Category: Solubility
Temp.: -35℃(refrigerant); 25~75℃(absorbent)

Data No.: C028-29
Fluids: AM, LNT, WA
Category: Solubility
Temp.: -35℃(refrigerant); 25~75℃(absorbent)

Data No.: C028-30
Fluids: AM, LB, WA
Category: Solubility
Temp.: -35℃(refrigerant); 25~75℃(absorbent)

Data No.: C028-31
Fluids: R22, DMETEG
Category: Solubility
Temp.: -42℃(refrigerant); 20℃~50℃(absorbent)

Data No.: C028-32
Fluids: R22, HMPT
Category: Solubility
Temp.: -42℃(refrigerant); 35~65℃(absorbent)

Data No.: C028-33
Fluids: R22, ETFE
Category: Solubility
Temp.: -42℃(refrigerant); 30~70℃(absorbent)

Data No.: C028-34
Fluids: R22, NMP
Category: Solubility
Temp.: -42℃(refrigerant); 30~70℃(absorbent)

Data No.: C028-35
Fluids: R22, DMF
Category: Solubility
Temp.: -42℃(refrigerant); 20~70℃(absorbent)

Data No.: C028-36
Fluids: R22, DMETrEG
Category: Solubility
Temp.: -42℃(refrigerant); 20~70℃(absorbent)

Author(s): Bokelmann,H. Renz,M. Steimle,F.
Title: Working fluids for low pressure absorption systems.
Source: I.I.F.-I.I.R.Congress, Commisson B1, Paris, 31 Aug.-7 Sep. 1983.

Paper No.: C029   Language: English
Reviewer: Japan-J Doc.type: Conference proceedings
Comment: Contains a series of studies on working fluids for absorption heat pumps, including data on solubility, etc. which overlap those in C028.

Author(s): Bokelmann,H. Ehmke,H.J. Renz,M. Steimle,F.
Title: NEW REFRIGERANT-ABSORBENT COMBINATIONS FOR ABSORPTION PLANTS.
Source: Energy Economics and Management in Industry, Vol.2. Reis, A.; Smith, I. Elmsford, NY: Pergamon Press. 1984 pp.205-208 Conf.: European congress on economics and management of energy in industry, Algarv
Paper No.: D015   Language: English
Reviewer: Japan-J Doc.type: Book Article; Conference
Comment: Explains about promising combinations of absorbents by type of refrigerant. TFE-NMP system, R123a-DMETEG system, NH3-LiNO3/H2O and R22-DMETrEG system are designated as being promising.

Data No.: D015-01
Fluids: TFE, NMP
Category:

Data No.: D015-02
Fluids: R123a, DMETEG
Category:

Data No.: D015-03
Fluids: AM, LNT, WA
Category:

Data No.: D015-04
Fluids: R22, DMETrEG
Category:

Author(s): Bokelmann,H.
Title: Auswahl, Messung thermophysikalischer Eigenschaften und Beurteilung der Eignung von Niederdruck-Stoffsystemen für Absorptionswärmepumpen.
Title Eng: Screening, Measuring of Thermophysical Properties and Evaluating of Working Fluids for Absorption Heat Pumps.
Source: Forschungsberichte des Deutshen Kälte-und Klimatechnischer Vereins Nr.12, 1984.
Paper No.: B033   Language: German
Reviewer: Japan-C Doc.type: Dissertation
Comment: By evaluating requirements for a working fluid, TFE-NMP and R123a-DMETEG were selected from various working pairs with TFE, R133a, R123a, R30 or [FE as refrigerant. Contains experimental data on PTX, density and viscosity of both systems.

Data No.: B033-01
Fluids: TFE, DBAd
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-02
Fluids: TFE, BEHA
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-03
Fluids: TFE, AMP
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-04
Fluids: TFE, n-BDEA
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-05
Fluids: TFE, Bpy
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-06
Fluids: TFE, DBAm
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-07
Fluids: TFE, DBE
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-08
Fluids: TFE, DBF
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-09
Fluids: TFE, DBM
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-10
Fluids: TFE, DEAlA
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-11
Fluids: TFE, DCHA
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-12
Fluids: TFE, DEGBEA
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-13
Fluids: TFE, DMETrEG
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-14
Fluids: TFE, TrEG
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-15
Fluids: TFE, Imi
Category: Solubility, Stability
Temp.: 0℃(refrigerant),30,50,70℃(absorbent); stability:45%,1
60℃

Data No.: B033-16
Fluids: TFE, Imi, QUN
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-17
Fluids: TFE, Imi, DMETEG
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-18
Fluids: TFE, Imi, HMPT
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-19
Fluids: TFE, Imi, TEG
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-20
Fluids: TFE, MEA
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-21
Fluids: TFE, MIm
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-22
Fluids: TFE, Nat
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-23
Fluids: TFE, FP
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-24
Fluids: TFE, DBP
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-25
Fluids: TFE, DEP
Category: Solubility
Temp.: 0℃(refrigerant), 30,50,70℃(absorbent)

Data No.: B033-26
Fluids: TFE, BEHP
Category: Solubility
Temp.: 0°C(refrigerant), 30,50,70°C(absorbent)

Data No.: B033-27
Fluids: TFE, BEHS
Category: Solubility
Temp.: 0°C(refrigerant), 30,50,70°C(absorbent)

Data No.: B033-28
Fluids: TFE, TEA
Category: Solubility
Temp.: 0°C(refrigerant), 30,50,70°C(absorbent)

Data No.: B033-29
Fluids: TFE, TEPA
Category: Solubility
Temp.: 0°C(refrigerant), 30,50,70°C(absorbent)

Data No.: B033-30
Fluids: TFE, THQ
Category: Solubility
Temp.: 0°C(refrigerant), 30,50,70°C(absorbent)

Data No.: B033-31
Fluids: TFE, Thy
Category: Solubility
Temp.: 0°C(refrigerant), 30,50,70°C(absorbent)

Data No.: B033-32
Fluids: TFE, TCP
Category: Solubility
Temp.: 0°C(refrigerant),30,50,70°C(absorbent)

Data No.: B033-33
Fluids: TFE, Sul
Category: Solubility
Temp.: 0°C(refrigerant),30,50,70°C(absorbent)

Data No.: B033-34
Fluids: TFE, QUN
Category: Solubility
Temp.: 0°C(refrigerant),20~80°C(absorbent); 50°C(refrigerant), 70~ 150°C(absorbent)

Data No.: B033-35
Fluids: TFE, DMETEG
Category: Solubility
Temp.: 0°C(refrigerant),20~80°C(absorbent); 50°C(refrigerant), 70~ 150°C(absorbent)

Data No.: B033-36
Fluids: TFE, EP
Category: Solubility, Stability
Temp.: 0°C(refrigerant),20~80°C(absorbent); 50°C(refrigerant), 70~ 150°C(absorbent)
Conc.: stability:69%,160~ 200°C

Data No.: B033-37

Fluids: TFE, HMPT
Category: Solubility
Temp.: 0℃(refrigerant),20～80℃(absorbent); 50℃(refrigerant), 70～ 150℃(absorbent)
Conc.: stability:60%,160～ 200℃

Data No.: B033-38
Fluids: TFE, IQUN
Category: Solubility
Temp.: 0℃(refrigerant),20～80℃(absorbent); 50℃(refrigerant), 70～150 ℃(absorbent)

Data No.: B033-39
Fluids: TFE, MP
Category: Solubility
Temp.: 0℃(refrigerant),20～80℃(absorbent); 50℃(refrigerant), 70～ 150℃(absorbent)

Data No.: B033-40
Fluids: TFE, NMP
Category: PVT-X, Solubility
Viscosity
Temp.: 0℃(refrigerant),20～80℃(absorbent); 50℃(refrigerant), 70～ 150℃(absorbent)
Conc.: stability:60%,160～200℃
Memo1: vapor pressure:-20～ 200℃,100～100kPa

Data No.: B033-41
Fluids: TFE, Pyr
Category: Solubility
Temp.: 0℃(refrigerant),20～80℃(absorbent); 50℃(refrigerant), 70～ 150℃(absorbent)

Data No.: B033-42
Fluids: TFE, TBP
Category: Solubility, Stability
Temp.: 0℃(refrigerant),20～80℃(absorbent); 50℃(refrigerant), 70～ 150℃(absorbent)
Conc.: stability:81%,160～200℃

Data No.: B033-43
Fluids: TFE, TEG
Category: Solubility
Temp.: 0℃(refrigerant),20～80℃(absorbent); 50℃(refrigerant), 70～ 150℃(absorbent)

Data No.: B033-44
Fluids: R133a, QUN
Category: Solubility
Temp.: 0℃(refrigerant); 30,50,70℃(absorbent)

Data No.: B033-45
Fluids: R133a, DMF
Category: Solubility, Stability
Temp.: 0℃(refrigerant); 30,50,70℃(absorbent)
Conc.: stability:62%, 160～200℃

Data No.: B033-46
Fluids: R133a, DMETrEG
Category: Solubility

Temp.: 0℃(refrigerant); 30,50,70℃(absorbent)

Data No.: B033-47
Fluids: R133a, MEA
Category: Solubility
Temp.: 0℃(refrigerant); 30,50,70℃(absorbent)

Data No.: B033-48
Fluids: R133a, NMP
Category: Solubility, Stability
Temp.: 0℃(refrigerant); 30,50,70℃(absorbent)
Conc.: stability: 64%, 160~200℃

Data No.: B033-49
Fluids: R133a, DBP
Category: Solubility
Temp.: 0℃(refrigerant); 30,50,70℃(absorbent)

Data No.: B033-50
Fluids: R133a, DEF
Category: Solubility, Stability
Temp.: 0℃(refrigerant); 20~80℃(absorbent)
Conc.: stability: 65%, 160~200℃

Data No.: B033-51
Fluids: R133a, DMETEG
Category: Solubility, Stability
Temp.: 0℃(refrigerant); 20~80℃(absorbent)
Memo1: stability: 75%(160~200℃)

Data No.: B033-52
Fluids: R133a, ETFE
Category: Solubility
Temp.: 0℃(refrigerant); 20~80℃(absorbent)

Data No.: B033-53
Fluids: R133a, HMPT
Category: Solubility
Temp.: 0℃(refrigerant); 20~80℃(absorbent)

Data No.: B033-54
Fluids: R123a, DMETEG
Category: PVT-X, Solubility
Stability
Temp.: 0℃(refrigerant); 20~80℃(absorbent)
Memo1: vapor pressure:-20~ 200℃, 5k~500kPa; density:20~90℃;
viscosity:10~90℃; stability:80%(160~200℃)

Data No.: B033-55
Fluids: R123a, DMETrEG
Category: Solubility
Temp.: 0℃(refrigerant); 20~80℃(absorbent)

Data No.: B033-56
Fluids: R123a, ETFE
Category: Solubility
Temp.: 0℃(refrigerant); 20~80℃(absorbent)

Data No.: B033-57
Fluids: R123a, TBP

Category: Solubility, Stability
Temp.: 0℃(refrigerant); 20~80℃(absorbent)

Data No.: B033-58
Fluids: R30, DMETEG
Category: Solubility
Temp.: 0℃(refrigerant); 30,50,70℃(absorbent)

Data No.: B033-59
Fluids: R30, HMPT
Category: Solubility
Temp.: 0℃(refrigerant); 30,50,70℃(absorbent)

Data No.: B033-60
Fluids: R30, DBP
Category: Solubility
Temp.: 0℃(refrigerant); 30,50,70℃(absorbent)

Data No.: B033-61
Fluids: TFA, DMETEG
Category: Solubility
Temp.: 0℃(refrigerant); 30,50,70℃(absorbet)

Author(s): Bokelmann,H. Ehmke,H.J. Steimle,F.
Title: Presentation of new working fluids for absorption heat pumps.
Source: EUR-10007-EN, Comm. Eur. Communities; Absorpt. Heat Pumps Congr., P.3-12.
Corp_src: Comm. Eur. Communities
Paper No.: D012 Language: English
Reviewer: Japan-J Doc.type: Report; Conference
Comment: PTX charts of TFE-NMP system, R123a-DMETEG system, methyl amine-ethylene glycol system, R22-DMETrEG system and NH3-LiNO3/H2O system are shown, as well as enthalpy-concentration charts of TFE-NMP system, R123a-DMETEG system and R22-DMETrEG system. However, these charts are contained in the literature D000.

Data No.: D012-01
Fluids: TFE, NMP
Category: PVT-X, Enthalpy

Data No.: D012-02
Fluids: R123a, DMETEG
Category: PVT-X, Enthalpy

Data No.: D012-03
Fluids: MA, EG
Category: PVT-X

Data No.: D012-04
Fluids: R22, DMETrEG
Category: PVT-X, Enthalpy

Data No.: D012-05
Fluids: AM, LNT, WA
Category: PVT-X, Viscosity

Author(s): Bokelmann,H. Ehmke,H.J. Steimle,F.
Title: Calorific diagrams of the working fluids TFE-NMP, R123a-DTG and R22-DTrG.
Source: Proceedings of Absorption Heat Pumps Congress, Paris, March 20-22, 1985, 13-22
Paper No.: B035 Language: English
Reviewer: Japan-C Doc.type: Conference proceedings
Comment: Concentration-enthalpy charts of TFE-NMP, R123a-DMETEG and R22-DMETrEG are given.

Data No.: B035-01
Fluids: TFE, NMP
Category: Enthalpy

Data No.: B035-02
Fluids: R123a, DMETEG
Category: Enthalpy

Data No.: B035-03
Fluids: R22, DMETrEG
Category: Enthalpy

Author(s): Bokelmann,Horst Nowazcyk,Ursula
Title: Sorption mixtures
Source: Patent no.3524737, Jan. 1985 (Germany, F.R.)
Corp_src: Universitaet Essen; GEA Luftkuehlergesellshaft Happel G.m.b.H. und Co.
Paper No.: D016 Language: German
Reviewer: Germany Doc.type: Patent

Author(s): Bokelmann,Horst Ehmke,Hans Juergen
Title: Erstellung von Enthalpie-Konzentrationsdiagrammen für Stoffsysteme für Absorptionswärmepumpen.
Title Eng: Determination of enthalpy-concentration charts of working fluids of absorption heat pumps.
Source: Ki, Klima, Kälte, Heiz., 1985, vol.13, no.6, P.241-4.
Paper No.: D017 Language: German
Reviewer: Japan-J Doc.type: Journal

Author(s): Boklelmann,h. Ehmke,H.J. Renz,M. Steimle,F.
Title: New Refrigerant-absorbent Combinations for Absorption Plants.
Source: Energy Economics and Management in Industry. Vol.2, Energy Management, Proceedings of the European Congress, Algrave, Portugal,April 2-5, 1984, Pergamon Press, New York.,p205-208
Paper No.: B034 Language: English
Reviewer: Japan-C Doc.type: Conference
Comment: Gives a general account of TFE-NMP, R123a-DMETEG, NH3-LiNO3/H2O and R22-DMETrEG (same as those systems in C031) which are recognized as being promising, as a result of a series of studies at Essen Univ. Vapor pressure equations for TFE and R123a are given.

Data No.: B034-01
Fluids: TFE
Category: Others

Temp.: -20~100℃

Data No.: B034-02
Fluids: R123a
Category: Others
Temp.: -50~80℃

Author(s): Boklemann,H. Renz,M.
Title: Thermophysikalische Eigenschaften von Tr ifluorethanol-Stoffsystemen für Absorptionswärmepumpen.
Title Eng: Thermophysical Properties of Trifluoroethanol Working Fluids for Absorption Heat Pumps.
Source: Ki, Klima, Kälte, Heizung., Vol.10, 1983, 403-406.
Paper No.: C030 Language: German
Reviewer: Japan-C Doc.type: Journal
Comment: Describes density, kinematic viscosity and vapor pressure data on TFE, and an empirical formula on vapor pressure. Empirical formulas on vapor pressure and density of TFE-NMP system are given. Also refers to thermal stability, toxicity and corrosiveness of TFE-NMP system.

Data No.: C030-01
Fluids: TFE, NMP
Category: PVT-X, Toxicity
Others
Pressure: PTX:100Pa~100kPa
Temp.: PTX: -20℃~ 100℃; density:20~90℃
Conc.: 0~100%

Author(s): Boklemann,H. Ehmke,H.J. Renz,M.
Steimle,F.
Title: Working fluids for sorption heat pumps, energy saving in buildings.
Source: Results of the European Communities R&D Programmes (1979-1983),Den Haag (Niederland) 14.-16. Nov, 1983 (wird von der Kommission der Europäischen Gemeinschaft veröffentlicht)
Paper No.: C031 Language: German
Reviewer: Japan-C Doc.type: Conference proceedings
Comment: By proposing TFE-NMP, R123a-DMETEG, R22-DMETrEG and NH3-LiNO3/H2O as new refrigerants and absorbents, PXT chart for each system is described. Additionally, they are compared to the already proposed NH3-H2O, R22-DMETEG and R123a-ETFE, in respect of quantity of solution circulated, pump power, quantity of solution heat exchanged, need for rectification, and toxicity. PTX data alone.

Data No.: C031-01
Fluids: TFE, NMP
Category: PVT-X, Corrosiveness
Toxicity
Pressure: 100~100kPa
Temp.: -20~100℃
Conc.: 0~100%

Data No.: C031-02
Fluids: R123a, DMETEG
Category: PVT-X, Stability

Toxicity
Pressure: 1k~500kPa
Conc.: 0~100%

Data No.: C031-03
Fluids: AM, LNT, WA
Category: PVT-X
Pressure: 5k~250kPa
Conc.: 0~100%

Data No.: C031-04
Fluids: R22, DMETrEG
Category: PVT-X
Pressure: 5k~250kPa
Conc.: 0~90%

Author(s): Boklemann,H. Ehmke,H.J.
Title: Stoffsysteme für Absorptionswärmepumpen-derzeitiger Stand und neue Entwicklungstendenzen.
Title Eng: Working Fluids for Absorption Heat Pumps-States of Arts and New Trends.
Source: gwf-gas/erdgas. vol.124, 1983, H. 12, 608-611.
Paper No.: C032 Language: German
Reviewer: Japan-C Doc.type: Journal
Comment: Describes the new working pairs TFE-NMP, R123a-DMETEG, R22-DMETrEG, NH3-LiBr/H2O and NH3-LiNO3/H2O, as well as already proposed NH3-H2O, H2O-LiBr, R22-DMETEG, R123a-ETFE and MeOH-LiBr-ZnBr2, from the point of view of fluids requirements. Contains no charts, tables and equations.

Author(s): Boklemann,H. Ehmke,H.J. Steimle,F.
Title: Presentation of new working for absorption heat pumps.
Source: University of Essen. Essen, Proceedings of Absorption Heat Pumps Congress, Paris, March 20-22, 1985.
Paper No.: B036 Language: English
Reviewer: Japan-C Doc.type: Conference proceedings
Comment: Describes PTX charts of TFE-NMP, R123a-DMETEG, CH3NH2-EG, R22-DMETrEG and NH3-LiNO3/H2O, and a viscosity chart of NH3-LiNO3/H2O.

Data No.: B036-01
Fluids: TFE, NMP
Category: PVT-X
Pressure: 100~100kPa
Conc.: 0~100%
Memo1: accuracy: 0.25-1.5% deviation

Data No.: B036-02
Fluids: R123a, DMETEG
Category: PVT-X
Pressure: 10k~500kPa
Conc.: 0~95%
Memo1: accuracy: 0.25~1.5% deviation

Data No.: B036-03
Fluids: MA, EG
Category: PVT-X
Pressure: 20k~1MPa

Conc.: 0~90%
Memo1: accuracy: 0.25~1.5% deviation

Data No.: B036-04
Fluids: R22, DMETrEG
Category: PVT-X
Pressure: 50k~2.5MPa
Conc.: 0~90%
Memo1: accuracy: 0.25-1.5% deviation

Data No.: B036-05
Fluids: AM, LNT, WA
Category: PVT-X, Viscosity
Pressure: PTX:5kPa~2.5MPa
Temp.: viscosity:20~90℃
Conc.: PVT: 0~84%; viscosity:50~84%
Memo1: accuracy: 0.25~1.5% deviation

Author(s): Borde,I.
Title: New working fluids for absorption units utilizing low grade heat.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C259 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings
Comment: As working refrigerant for utilizing heat at low temperature as effectively as possible, R22 is used, and compatibility of R22 with several types of absorbent is examined.

Author(s): Borde,I. Jelinek,M.
Title: Thermodynamic Properties of Binary Fluid Mixtures for Absorption Refrigeration systems.
Source: ASME Winter Anual Meeting (Anaheim,Calf.), Dec. 7-12, 1986
Paper No.: B236 Language: English
Reviewer: Japan-A Doc.type: Conference proceedings
Comment: By establishing a simplified method (half theoretical, half experimental) for obtaining a PTX chart and an enthalpy-concentration chart necessary for evaluating various types of refrigerant-absorbent pairs, theoretical values for R22-DMMP were compared with the experimental values. As experimental values, those obtained by the authors and those reported in literatures are used.

Data No.: B236-01
Fluids: R22, DMMP
Category: PVT-X, Enthalpy
Specific_heat
Pressure: 0~2MPa
Temp.: 0~140℃
Conc.: 0~100%

Author(s): Borde,I. Jelinek,M.
Title: Evaluation of thermodynamic properties of binary fluid mixtures.
Source: Heat and Mass Transfer in Refrigeration and Cryogenics. Proceedings of the International Centre for Heat and Mass

Transfer, Vol.24, 1987, p381-392.
Paper No.: E029 Language: English
Reviewer: Doc.type: Conference proceedings

Data No.: E029-01
Fluids: R22, NMP
Category: Solubility, Enthalpy
Heat_pump, COP
Temp.: evaporation: 0 ℃, condensation: 30 ℃

Author(s): Boryta,D.A.
Title: Solubility of lithium bromide in water between -50。c and +100。c(45-70%lithium bromide).
Source: J. Chem. Eng. Data, Vol.15, No.1, p142-144, 1961.
Paper No.: A040 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Obtained solubility of lithium bromide into water. Solubility data alone.

Data No.: A040-01
Fluids: WA, LB
Category: Solubility
Temp.: -50～100℃
Conc.: 45～70wt%(LiBr)

Author(s): Boutevin,Bernard Hervaud,Yves Rolland,Laurence
Title: Chlorofluorohydrocarbon mixtures as stable working fluids for absorption heat pumps.
Source: Patent no.2575174 (France), June 1986.
Corp_src: Gaz de France
Paper No.: D018 Language: French
Reviewer: Belgium Doc.type: Patent

Author(s): Bugarel,R.
Title: Some results on absorption heat pump.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C260 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings
Comment: Describes absorption cycles, absorbers and working fluids of absorption heat pumps. Introduces the literatures .

Author(s): Bugarel,R. Huor,M.H. Prevost,M.
Title: Performances of absorption machines according to the loading.
Source: Int. Workshop on Research Activities on Advanced Heat Pumps, 1986, p.279-289, Graz, Austria.
Paper No.: E033 Language: English
Reviewer: Belgium Doc.type: Conference proceedings

Data No.: E033-01
Fluids: R21, DMETEG
Category: Heat_pump, Refrigerating_machine
COP, Operation_or_control
Temp.: evaporator: 5 C, generator: 105 - 150 C, absorber & conden ser: 40 - 50 C.

Author(s): Bunte,H.J.
Title: Ein thermodynamisches Potential für das System Methanol - Lithiumbromid.
Title Eng: Thermodynamic potential for the methanol/lithium bromide system.
Source: Diss. (Dr.-Ing.), NP-7770100, Jul. 1984, 159p; NTIS, PC A08, U.S. sales only.
Corp_src: Hanover Univ. (Germany, F.R.). Fakultaet fuer Maschinenwesen.
Paper No.: D020 Language: German
Reviewer: Germany Doc.type: Dissertation
Comment: Determination of a thermodynamic potential for pure methanol (liquid and vapor) and for liquid methanol-LiBr solutions.

Data No.: D020-01
Fluids: MA1, LB
Category: Others

Author(s): Cheron,J.
Title: Mise au Point D'Une Pompe à Chaleur à Absorption Résorption. Etude de Couples Soluté-Solvent.
Title Eng: Experimentation of an absorption - resorption heat pumps. Study of solute - sovent pairs.
Source: EUR-9467,1984, 130p.
Corp_src: Comm. Eur. Communities
Paper No.: D024 Language: French
Reviewer: Belgium Doc.type: Report

Data No.: D024-01
Fluids: CDO, E1A
Category: Solubility
Pressure: 4.85 to 8.30 bar
Temp.: 25 C to 75 C

Data No.: D024-02
Fluids: CDO, DEA1A
Category: Solubility
Pressure: 0.92 to 20 bar
Temp.: 0 to 75 C

Data No.: D024-03
Fluids: WA, DEA1A
Category: Solubility
Pressure: 0.92 to 20 bar
Temp.: 0 to 75 C

Data No.: D024-04
Fluids: WA, E1A
Category: Solubility
Pressure: 4.85 to 8.30 bar
Temp.: 25 to 75 C

Author(s): Clifford,I.L. Hunter,E.
Title: The system ammonia-water at temperatures up to 150∘c and at pressures up to twenty atmospheres.

Source: J. Phys. Chem., Vol.37, p101-18, 1933.
Paper No.: B045 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: (1) By measuring the P, T, x relations, tables and charts were prepared, while using the previous data. (2) Old.

Data No.: B045-01
Fluids: AM, WA
Category: PVT-X, Crystallization
Pressure: 0.24～20.3bar
Temp.: 60～150℃

Author(s): Cohen,A. Jelinek,R.V.
Title: Corrosion rate of mild steel in alkaline lithium bromide solutions by the polarization resistance method.
Source: Corros., Vol.22, p39-47, 1966 February.
Paper No.: A046 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: (1) Research on the polarization resistance method as a method for measuring the rate of corrosion. (2) Examination of an effect of lithium chromate, a corrosion inhibitor for mild steel in lithium bromide solution. The experimental conditions, however, are not practical.

Data No.: A046-01
Fluids: WA, LB, LCr
Category: Corrosiveness
Pressure: atmospheric pressure
Temp.: 25℃
Conc.: 54%LiBr,0.2%LiOH,0～3000ppmLiCrO4

Author(s): Colschen,R.
Title: Sorption Heat Pumps. A Literature Survey.
Source: LUTKDH/TKKA-3001-1-120, 1984 (Sweden), 119p.
Corp_src: Lund Inst. of Tech. (Sweden). Avdelningen foer Apparatteknik.
Paper No.: D026 Language: Swedish
Reviewer: Sweden Doc.type: Report

Author(s): Colschen,R.
Title: Sorptionsvärmepumpar.
Title Eng: Sorption heat pumps.
Source: LUTKDH/(TKKA-3001)/1-120/(1984).
Corp_src: Dep. Chem. Eng., Lund Inst. Tech., Sweden.
Paper No.: E004 Language: Swedish
Reviewer: Sweden Doc.type: Report
Comment: A comprehensive literature study on sorption heat pumps including systematization of the calculation procedures, measurement and data correlation of thermodynamic and physical properties, improvement of the design of the generator and absorber, development of computer program and technical-economical optimization.

Author(s): Dancy,E.A. Chrétien,N.
Title: Pompes à Chaleur Chimiques - Essais sur Quatres Matériaux Absorbents.

Title Eng: Chemical heat pumps - test on 4 absorbent materials.
Source: France: IREQ, Production et Utilisation de l'Energie, (Report No. IREQ-8RT-3290G), 1985.
Paper No.: E045 Language: French
Reviewer: Belgium Doc.type: Report

Data No.: E045-01
Fluids: WA, MgC
Category: Solubility, Heat_pump

Data No.: E045-02
Fluids: WA, PC
Category: Solubility, Heat_pump

Data No.: E045-03
Fluids: WA, Z1
Category: Solubility, Heat_pump

Author(s): Davidson,W.F. Erickson,D.C.
Title: New_High Temperature Absorbent for Absorption Heat Pumps. Final Report.
Source: ORNL/Sub-85-22013/1, May 1986, 60p; NTIS, PC A04/MF A01
Corp_src: Energy Concepts Co., Annapolis, MD. *Department of Energy, Washington, DC.
Paper No.: D027 Language: English
Reviewer: Japan-J Doc.type: Report
Comment: Research on working fluids for high-temperature heat pumps aimed to deliver higher than 260℃ of output temperature. By proposing H2O-LiNO3/KNO3/NaNO3 system, its thermodynamic properties, corrosiveness and thermal stability are measured. It is pointed out that one of the advantages of this system is that it can lead to reduced cost of material, since it promotes the formation of a corrsion resistant oxide film on both mild steel and stainless steel. Also, the COP was calculated and found to be almost the same as that of H2O-LiBr system.

Data No.: D027-01
Fluids: WA, LNT, PN, SN
Category: PVT-X
Conc.: 53wt%(LiNO3); 28wt%(KNO3); 19wt%(NaNO3)

Author(s): Dietrich,E. Trapp,J.C. Le Goff,P. Jeday,M.
Title: Relations between coefficient of performance, energy storage capacity and temperature lift for thirty working pairs used in absorption and adsorption heat pumps.
Source: Int. Workshop on Research Activities on Advanced Heat Pumps, 1986, p.215-233, Graz, Austria.
Paper No.: E032 Language: English
Reviewer: Belgium Doc.type: Conference proceedings

Data No.: E032-01
Fluids: WA, SA
Category: Heat_pump, COP
Temp.: 0 C in evaporator, 48 C in condenser

Data No.: E032-02

Fluids: MA1, LB, ZB
Category: Heat_pump, COP
Temp.: 0 C in evaporator, 48 C in condenser
Conc.: LB:ZB=1:1 (in mole)

Data No.: E032-15
Fluids: MA1, LT
Category: Heat_pump, COP
Temp.: 0 C in evaporator, 48 C in condenser

Data No.: E032-16
Fluids: AM, LT
Category: Heat_pump, COP
Temp.: 0 C in evaporator, 48 C in condenser

Data No.: E032-17
Fluids: MA, LT
Category: Heat_pump, COP
Temp.: 0 C in evaporator, 48 C in condenser

Data No.: E032-18
Fluids: MA1, Thy
Category: Heat_pump, COP
Temp.: 0 C in evapoarator, 48 C in condenser

Data No.: E032-19
Fluids: AM, ST
Category: Heat_pump, COP
Temp.: 0 C in evaporator, 48 C in condenser

Data No.: E032-20
Fluids: AM, LT
Category: Heat_pump, COP
Temp.: 0 C in evaporator, 48 C in condenser

Data No.: E032-21
Fluids: AM, 1,4 BDL
Category: Heat_pump, COP
Temp.: 0 C in evaporator, 48 C in condenser

Data No.: E032-22
Fluids: AM, WA, LNT
Category: Heat_pump, COP
Temp.: 0 C in evaporator, 48 C in condenser

Data No.: E032-23
Fluids: MA1, CC
Category: Heat_pump, COP
Temp.: 0 C in evaporator, 48 C in condenser

Data No.: E032-24
Fluids: AM, SrC
Category: Heat_pump, COP
Temp.: 0 C in evaporator, 48 C in condenser

Data No.: E032-25
Fluids: WA, Z1
Category: Heat_pump, COP
Temp.: Low: 0 C, high: 48 C

Fluids: WA, EG
Category: Heat_pump, COP
Temp.: 0 C in evaporator, 48 C in condenser

Data No.: E032-03
Fluids: MA1, EG
Category: Heat_pump, COP
Temp.: 0 C in evaporator, 48 C in condenser

Data No.: E032-04
Fluids: AM, WA
Category: Heat_pump, COP
Temp.: 0 C in evaporator, 48 C in condenser

Data No.: E032-05
Fluids: AM, WA, LB
Category: Heat_pump, COP
Temp.: 0 C in evaporator, 48 C in condenser

Data No.: E032-06
Fluids: MA, WA
Category: Heat_pump, COP
Temp.: 0 C in evaporator, 48 C condenser

Data No.: E032-07
Fluids: MA, WA, LB
Category: Heat_pump, COP
Temp.: 0 C in evaporator, 48 C in condenser

Data No.: E032-08
Fluids: TFE, NMP
Category: Heat_pump, COP
Temp.: 0 C in evaorator, 48 C in condenser

Data No.: E032-09
Fluids: R123a, DMETEG
Category: Heat_pump, COP
Temp.: 0 C in evaporator, 48 C in condenser

Data No.: E032-10
Fluids: R123a, NMP
Category: Heat_pump, COP
Temp.: 0 C in evaporator, 48 C in condenser

Data No.: E032-11
Fluids: R22, DMETEG
Category: Heat_pump, COP
Temp.: 0 C in evaporator, 48 C in condenser

Data No.: E032-12
Fluids: WA, LB
Category: Heat_pump, COP
Temp.: 0 C in evaporator, 48 C in condenser

Data No.: E032-13
Fluids: WA, SH
Category: Heat_pump, COP
Temp.: 0 C in evaporator, 48 C in condenser

Data No.: E032-14

Author(s): Dorairaj,S. Agarwal,R.S.
Title: Prediction of transport properties of R22-DMF refrigerant-absorbent combinations.
Source: Int. J. Refrig., Vol.10, July 1987, p224-228.
Paper No.: D278 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Does not present anything new. Calculations are actually attempted on thermal conductivity, viscosity, sruface tension, specific heat, density, and thermal diffusivity by using equations which are thought to be suitable for them, selected from among those proposed so far.

Data No.: D278-01
Fluids: R22, DMF
Category: Surface_tension, Viscosity
Thermal_conductivity

Author(s): Eding,H.J. Brady,A.P.
Title: Refrigerant-absorbent systems.
Source: SRI Project No. S-3372 Final Report prepared for Roy C. Ingersoll Reserch Center, Borg-Warner Corporation, Menlo Park, California: Standford Research Institute. March 31, 1961.
Paper No.: A050 Language: English
Reviewer: Japan-A Doc.type:

Author(s): Edwards,T.J. Newman,J. Prausnitz,J.M.
Title: Thermodynamics of vapor-liquid equilibra for the ammonia water system.
Source: Ind. Eng. Chem. Fund., Vol.17, No.4, p264-269, 1978.
Paper No.: A051 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: (1) A new expression for the activity coefficient of ammonia-water system is proposed by using hyperbolic tangents. (2) Conventional experimental data on gas-liquid equilibrium have thermodynamic contradictions, due probably to incorrectness of water concentration (less than 1%) in gas and liquid phases.

Data No.: C052-01
Fluids: AM, WA
Category: PVT-X

Author(s): Ehmke,H.J. Renz,M.
Title: Ternary working fluids for absorption systems with salt-liquid-mixtures as absorbent.
Source: I.I.F-I.I.R. Congress, Commission B1, Paris, 31 Aug.-7 Sep., 1983.
Paper No.: C052 Language: English
Reviewer: Japan-J Doc.type: Conference proceedings
Comment: (1) Experimented with solubility and viscosity of ternary working fluids with ammonia or methyl amine as refrigerant. (2) Recommended ammonia-LiNO3/H2O (20~25wt%).

Data No.: C052-01
Fluids: MA, LB, WA
Category: Solubility

Temp.:   20~60℃(absorbent);-10℃(refrigerant)

Data No.: C052-02
Fluids: MA, LNT, WA
Category: Solubility
Temp.:   20~60℃(absorbent);-10℃(refrigerant)

Data No.: C052-03
Fluids: AM, LB, WA
Category: Solubility
Temp.:   30~75℃(absorbent);-35℃(refrigerant)

Data No.: C052-04
Fluids: AM, LNT, WA
Category: Solubility
Temp.:   30~75℃(absorbent);-35℃(rerigerant)

Author(s): Ehmke,H.J.
Title: Stoffsysteme für Absorptionswärmepumpen. Experimentelle Bestimung thermophysikalischer Eigenschaften von Lösungen der Kältemittel Methylamin, Ammoniak und Monochlordifluormethan (R22).
Title Eng: Working fluids for absorption heat pumps. Experimental determination of the thermophysical properties of solutions of the refrigerants methylamine, ammonia, and monochloride difluoromethane(R22).
Source: Thesis, NP-6770179, 1984, 136p. University Essen.
Corp_src: Deutscher Kälte- und Klimatechnischer Verein e.V., Stuttgart (Germany, F.R.). *Essen Univ. (Gesamthochschule) (Germany, F.R.). Fachbereich Energie-, Verfahrens- u nd Elektrotechnik.
Paper No.: D031   Language: German
Reviewer: Germany   Doc.type: Dissertation
Comment: Vapor pressure of various solutions.

Data No.: D031-01
Fluids: MA, EG
Category: PVT-X
Pressure: 0.2 - 10 bar
Temp.:   20 - 180 ℃
Conc.:   0.14 - 0.61 (molar fraction)

Data No.: D031-02
Fluids: AM, LNT, WA
Category: PVT-X, Solubility
               Crystallization, Viscosity
Pressure: 0.5 - 20 bar
Temp.:   -20 - 200 ℃
Conc.:   0.16 - 1.0 molar fraction

Data No.: D031-03
Fluids: R22, DMETEG
Category: PVT-X
Pressure: 0.5 - 20 bar
Temp.:   -20 - 200 ℃
Conc.:   0.1 - 1.0 molar fraction

Data No.: D031-04
Fluids: R22, DMETrEG

Category: PVT-X
Pressure: 0.5 - 20 bar
Temp.: -20 - 200 ℃
Conc.: 0.1 - 1.0 molar fraction

Author(s): Eichholz,H.D.
Title: Korrelation experimentell bestimmter Zustandsgrößen elektolytischer Methanollösungen als Arbeitsmittelgemische für Absorptionswärmepumpen mit einer Fundamentalgleichung.
Title Eng: Correlation between experimentally determined properties of state and a fundamental equation for electrolytic methanol solutions used as working fluids for absorption heat pumps.
Source: Dissertation NP-4770171,1982,167p.
Corp_src: Deutscher Kälte- und Klimatechnischer Verein e.V., Stuttgart (Germany,F.R.); Dortmund Univ. (Germany,F.R.). Abt. Chemietechnik (9201842; 9200627)
Paper No.: D032 Language: German
Reviewer: Germany Doc.type: Report; Dissertation

Data No.: D032-01
Fluids: MA1, LB
Category: PVT-X, Enthalpy
Temp.: Heat of mixing: 25, 40 ℃; PTx: 20 - 100 ℃
Conc.: Heat of mixing: 0 - 0.6 mass fraction LiBr; PTx: 0 - 0.55 mass fraction LiBr

Data No.: D032-02
Fluids: MA1, ZB
Category: PVT-X, Enthalpy
Temp.: Heat of mixing: 40 ℃; PTx: 20 - 100 ℃
Conc.: Heat of mixing: 0 - 0.7; PTx: 0 - 0.7 (mass fraction ZnBr 2)

Data No.: D032-03
Fluids: MA1, LB, ZB
Category: Enthalpy
Temp.: 40 ℃
Conc.: 0.2 - 1.0 mass fraction methanol; LiBr:ZnBr2 = 2:1 (molar fraction)

Author(s): Eisa,M.A.R. Holland,F.A.
Title: A study of the optimum interaction between the working fluid and the absorbent in absorption heat pump systems.
Source: Heat Recovery Syst. CHP, 1987, Vol.7, No.2, P.107-17.
Paper No.: D036 Language: English
Reviewer: USA Doc.type: Journal
Comment: Clear and concise statements regarding requirements for selection of AHP working fluids, of thermodynamic limitations, as well as of physicochemical/thermodynamic rules. This paper outlines also very clearly conditions for optimum interactions that would results in optimum selections for absorber temperature vs. absorbent solubility, generator temperature vs. negative deviations from Raoult's law, low temperature lifts vs. deviations from Raoult's law.

Author(s): Eiseman,B.J. Jr.
Title: Why refrigerant 22 should be favored for absorption refrigeration.
Source: ASHRAE J., p45-50, December 1959.
Paper No.: A054 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: By experimenting with solubility and stability of working pairs with 6CFCs as refrigerant in a condition where metal coexist, R22-DMETEG combination is recommended.

Data No.: A054-01
Fluids: R21, DMETEG
Category: Enthalpy, Stability
Refrigerating_machine
Temp.: stability:121℃

Data No.: A054-02
Fluids: R133A, DMETEG
Category: Refrigerating_machine

Data No.: A054-03
Fluids: R31, DMETEG
Category: Enthalpy, Stability
Refrigerating_machine

Data No.: A054-04
Fluids: R124a, DMETEG
Category: Refrigerating_machine

Data No.: A054-05
Fluids: R134, DMETEG
Category: Refrigerating_machine

Data No.: A054-06
Fluids: R22, DMETEG
Category: Enthalpy, Stability
Refrigerating_machine
Temp.: stability:121~177℃

Data No.: A054-07
Fluids: R30, DMETEG
Category: Enthalpy, Stability
Refrigerating_machine
Temp.: stability:121℃

Data No.: A054-08
Fluids: R22, CHN
Category: Enthalpy

Data No.: A054-09
Fluids: R21, CHN
Category: Enthalpy

Data No.: A054-10
Fluids: R30, CHN
Category: Enthalpy

Data No.: A054-11
Fluids: R31, CHN
Category: Enthalpy

Data No.: A054-12
Fluids: R21, TBP
Category: Enthalpy

Data No.: A054-13
Fluids: R30, TBP
Category: Enthalpy

Data No.: A054-14
Fluids: R22, APN
Category: Enthalpy

Data No.: A054-15
Fluids: R21, APN
Category: Enthalpy

Data No.: A054-16
Fluids: R30, APN
Category: Enthalpy

Data No.: A054-17
Fluids: R31, APN
Category:

Data No.: A054-18
Fluids: R22, IPN
Category: Enthalpy

Data No.: A054-19
Fluids: R21, IPN
Category: Enthalpy

Data No.: A054-20
Fluids: R30, IPN
Category: Enthalpy

Data No.: A054-21
Fluids: R31, IPN
Category:

Data No.: A054-22
Fluids: R30, EMPO
Category: Enthalpy

Data No.: A054-23
Fluids: R30, DMETEG, TMU
Category: Enthalpy
Conc.: 75/25,50/50,25/75(DMETEG/TMU by volulme)

Data No.: A054-24
Fluids: R30, TMU
Category: Enthalpy

Data No.: A054-25
Fluids: R30, DMA
Category: Enthalpy

Data No.: A054-26
Fluids: R30, DMSO
Category: Enthalpy

Data No.: A054-27
Fluids: R30, LO
Category: Enthalpy

Data No.: A054-28
Fluids: R30, DIBP
Category: Enthalpy

Data No.: A054-29
Fluids: R30, THF
Category: Enthalpy

Data No.: A054-30
Fluids: R30, DECAd
Category: Enthalpy

Data No.: A054-31
Fluids: R30, AdN
Category: Enthalpy

Data No.: A054-32
Fluids: R30, DIPCAd
Category: Enthalpy

Data No.: A054-33
Fluids: R30, DMCAd
Category: Enthalpy

Data No.: A054-34
Fluids: R30, Sul
Category: Enthalpy

Data No.: A054-35
Fluids: R30, DEE
Category: Enthalpy

Data No.: A054-36
Fluids: R30, Act
Category: Enthalpy

Data No.: A054-37
Fluids: R30, MFAd
Category: Enthalpy

Data No.: A054-38
Fluids: R30, DMS
Category: Enthalpy

Data No.: A054-39
Fluids: R30, TEAm
Category: Enthalpy

Data No.: A054-40
Fluids: R30, Pyri
Category: Enthalpy

Data No.: A054-41
Fluids: R30, ES
Category: Enthalpy

Data No.: A054-42
Fluids: R30, NP
Category: Enthalpy

Data No.: A054-43
Fluids: R30, EPh
Category: Enthalpy

Data No.: A054-45
Fluids: R30, AA
Category: Enthalpy

Data No.: A054-46
Fluids: R30, TIBP
Category: Enthalpy

Data No.: A054-47
Fluids: R30, 1,4 BDL
Category: Enthalpy

Data No.: A054-48
Fluids: R30, BDS
Category: Enthalpy

Data No.: A054-49
Fluids: R30, DMSL
Category: Enthalpy

Data No.: A054-50
Fluids: R30, AN
Category: Enthalpy

Data No.: A054-51
Fluids: R30, MAl
Category: Enthalpy

Data No.: A054-52
Fluids: R30, EAl
Category: Enthalpy

Data No.: A054-53
Fluids: R12
Category: Stability
Temp.: 121℃

Data No.: A054-54
Fluids: R22
Category: Stability
Temp.: 121℃

Data No.: A054-55
Fluids: R21
Category: Stability
Temp.: 121℃

Data No.: A054-56
Fluids: DMETEG
Category: Stability
Temp.: 121～177℃
Data No.: A054-44
Fluids: R30, ESE
Category: Enthalpy

Author(s): Eng,F.P. Ishida,H.
Title: Corrosion protection on copper by new polymeric agents-polyvinylimidazoles.
Source: J. Mater. Sci. (GB), May 1986, vol.21, no.5, P.1561-8.
Paper No.: D042 Language: English
Reviewer: Japan-A Doc.type: Journal
Comment: (1) Polyvinylimidazole is effective as a corrosion inhibitor for copper and copper alloy at high temperature. a) Below 250℃, the coated film incurs no change, and even at 400℃, can suppress oxidation of copper. b) Polyvinylimidazole is superior in anticorrosive effect to benzotriazole or imidazoles. (2) Fourier transform infrared reflection-absorption spectroscopy is a very effective method in research on polymeric coatings and metal corrosion.

Data No.: D042-01
Fluids: PVImi
Category: Corrosiveness

Author(s): Erickson, Donald C.
Title: A high temperature noncorrosive absorption working pair.
Source: EUR-10007-EN; Comm. Eur. Communities, (Rep.) EUR (1985); Absorpt. Heat Pumps Congr., P.327-38.
Corp_src: Comm. Eur. Communities
Paper No.: D043 Language: English
Reviewer: Japan-A Doc.type: Report; Conference
Comment: A new absorbent for water can cause an absorption cycle action even when the temperature is as high as 260℃. Comparing with LiBr, it also is advantageous on that mild steel can be used over the wide temperature region. Thus, it is suggested that, when the new absorbent is used, an absorption heat pump can be realized at a low cost. This paper reports the point alone, and refers to no concrete details at all.

Author(s): Erickson,Donald C.
Title: High temperature absorbent for water vapor.
Source: Patent no.4563295 (USA), Jan. 1986.
Paper No.: D044 Language: English
Reviewer: USA Doc.type: Patent
Comment: The patent discloses a novel fluid and a process for use of the fluid in heat transformation. The fluid is comprised of water as the refrigerant and an absorbent comprised of least 20 mole percent of $LiNO_3$, 20 mole percent of KNO_3 and 10 mole percent of $NaNO_3$ in anhydrous form. The aqueous component of the solution varies between 1 and 50 mole percent. The new fluid is capable of absorbing water vapor above 200℃ and specifically below 260℃.

Author(s): Ewing,W.W. Fisher,H.M.
Title: Studies on the vapor pressure-temperature relations of the

binary system zinc nitrate-water.
Source: J. Am. Chem. Soc., Vol.59, p1046-1048, June 1937.
Paper No.: A058 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Working medium for chemical heat pumps.

Data No.: A058-01
Fluids: WA, ZN
Category: PVT-X, Crystallization
Temp.: 10~60℃
Conc.: 0~82%

Author(s): Felli,M. Galli,G.
Title: Vapour-liquid equilibrium properties of non-electrolyte mixtures for use in absorption refrigeration.
Source: Int. J. Refrig., Vol.4, No.6, 1981, P323-328.
Paper No.: D191 Language: English
Reviewer: Japan-C Doc.type: Journal
Comment: (1) By means of Redlich-Kwong and Clausius equations, correlation equations for PTX data on ethylene glycol-methanol was obtained. It was found that Redlich-Kwong equation was more suitable. (2) Range and accuracy of experiment: a) Pressure: 0.5~30kPa (±0.12kPa), 30~120kPa (±0.85kPa) b) Temperature: 273~383K (±0.3K) c) Concentration: 0.1~0.6 mass fraction of CH3OH (±0.3%).

Data No.: D191-01
Fluids: MA1, EG
Category: PVT-X
Pressure: 0.5~120kPa
Temp.: 273~383K
Conc.: 0.1~0.6 (mass fraction of methanol)

Author(s): Felsing,W.A. Thomas,A.R.
Title: Vapor pressures and other physical constans of methylamine and methylamine solutions.
Source: Ind. Eng. Chem., Vol.21, 1929, p1269-1272.
Paper No.: C059 Language: English
Reviewer: Japan-J Doc.type: Journal

Data No.: C059-01
Fluids: MA, WA
Category: PVT-X
Temp.: 0~90℃
Conc.: (0)~48.60mol%

Author(s): Gensch,K.
Title: Lithiumnitratammoniakat als absorptionsflèssigkeit fèr kéltemaschinen.
Source: Zeitschr. Kélte-Ind., Vol.1, 2. 1937.
Paper No.: C062 Language: French
Reviewer: Doc.type:

Author(s): George,J.H.B. Birkett,J.D.
Title: Study of liquid ammonia-salts systems and their potential application to the absorption cooling process.

Source: Projects ZF-72 and ZF-72a Final Report prepared for American Gas Association. New York: American Gas Association, 1965. (Catalog No. M10090.)
Paper No.: A063 Language: German
Reviewer: Japan-H Doc.type:

Author(s): Gerritsen,H.G. Flores,A.
Title: Precalculation of characteristic values, an applicability test for absorption heat pump working fluids.
Source: Ki, Klima, Kälte, Heiz., 1987, vol.15, no.5, P.226-8.
Paper No.: D046 Language: German
Reviewer: Japan-F Doc.type: Journal
Comment: In order to simplify the search for working fluids for absorption heat pumps, provisional calculation is made. Parameters in Redlich-Kwong equation of state for a mixture is determined from two measuring points on the vapor pressure curve. Thus, without any detailed experiment, it can evaluate the absorbent in question with relatively favorable accuracy.

Data No.: D046-01
Fluids: WA, AM
Category: PVT-X, Heat_pump

Data No.: D046-02
Fluids: R123a, ETFE
Category: PVT-X, Heat_pump

Data No.: D046-03
Fluids: TFE, DMETEG
Category: PVT-X, Heat_pump

Data No.: D046-04
Fluids: TFE, NMP
Category: PVT-X, Heat_pump

Author(s): Girgis,M.M.
Title: Experimentelle Ermittlung der thermischen Zustandsgrößen von Arbeitsfluiden für Absorptionswärmepumpen.
Title Eng: Experimental determination of the properties of working mixtures for absorption heat pumps.
Source: BMFT-FB-T-84-068; May 1984. 73p.
Corp_src: Bundesministerium für Forschung und Technologie, Bonn-Bad Godesberg, FRG.
Paper No.: D047 Language: German
Reviewer: Germany Doc.type: Report

Data No.: D047-01
Fluids: MAl, LB, ZB
Category: PVT-X, Solubility
Crystallization, Stability
Temp.: Phase equilibrium: 15-140 ℃, solubility: -40 - 180 ℃, stability: 90 130 ℃
Conc.: LiBr/ZnBr2 = 0, 1, 2, 3, 4, ∞ (molar ratio); phase equilibrium: 0.3-1.0 (mass fraction methanol); stability:0.6-0.75

Author(s): Girsberger,W.
Title: Hochtemperatur-Absorptionswärmepumpe.
Title Eng: High temperature absorption heat pump.
Source: Diss. ETH., Vol 6756, 1981.
Paper No.: B064 Language: German
Reviewer: Japan-G Doc.type: Dissertation
Comment: This paper surveys the working fluids applied to 200 ℃ class of high temperature absorption heat pumps, thus several types of organic compounds, such as quinoline having benzene nucleus, with alcohole fluoride as refrigerant are selected. In terms of solubility and vapor pressure, TFE and QUN combination is recognized as being the best. However, no research was made on heat of mixing, specific heat, etc.

Data No.: B064-01
Fluids: TFE, QUN
Category: PVT-X, Solubility
Stability
Pressure: liquid TFE:0.28MPa~0.30MPa; liquid QUN:1kPa~0.101MPa
Temp.: liquid TFE:100~ 200℃; liquid QUN:100~ 200℃; solubility :60,70℃
Conc.: Liquid data of pure TFE and QUN are reported.

Author(s): Granryd,E.
Title: A double effect absorption system.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C261 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings
Comment: Proposed on pumping of refrigerant solution between an absorber and generator to be achieved by placing a vapor motor or turbine between the generator and condenser.

Author(s): Grossman,G.
Title: Combined heat and mass transfer in absorption processes.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C262 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings
Comment: Analyzes heat of absorption occurring when heat transfer and mass transfer take place simultaneously in the absorber. So far, it has been treated only as an isolated phenomenon.

Author(s): Hasaba,S. Kawai,K. Kawasaki,K
Title: リチュームブロマイドー水系吸収式冷凍機の研究 ーリチュームブロマイド水溶液の蒸気圧に就いてー
Title Eng: Vapor pressure of aqueous solution of LiBr.
Source: 冷凍; Refrigeration, Vol.34, No.380, p496, 1959.
Paper No.: B066 Language: Japanese
Reviewer: Japan-I Doc.type: Journal
Comment: Measured the vapor pressure of LiBr-H2O system.

Data No.: B066-01
Fluids: WA, LB
Category: PVT-X

Author(s): Hasaba,S. Kawai,K. Kawasaki,K.
Uemura,T.
Title: リチウム・ブロマイドー水系吸収式冷凍機の研究 ーリチウム・ブロマイド水溶液の熱力学的性質についてー
Title Eng: Specific heat of aqueous solution of LiBr in water and solubility.
Source: 冷凍; Refrigeration, Vol.35, No.397, p815, 1960.
Paper No.: B067 Language: Japanese
Reviewer: Japan-I Doc.type: Journal
Comment: Measured the specific heat and solubility of LiBr-H2O system. Solubility was measured in both the presence and absence of corrosion inhibitor (lithium chromate).

Data No.: B067-01
Fluids: WA, LB
Category: Solubility, Specific_heat
Temp.: 20～130℃

Data No.: B067-02
Fluids: WA, LB, LCr
Category: Solubility
Memo1: LCr:INHIBITOR.

Author(s): Hasaba,S. Uemura,T. Aratani,T.
Title: モノ・エチルアミン水溶液の熱力学的性質について（比重，比熱及び混合熱について）
Title Eng: Some thermal properties of monoethylamine-water solutions.
Source: 冷凍; Refrigeration, Vol.35, No.395, p671, 1960.
Paper No.: B069 Language: Japanese
Reviewer: Japan-I Doc.type: Journal
Comment: Measured density, specific heat and heat of mixing of monoethylamine solution.

Data No.: B069-01
Fluids: EA, WA
Category: PVT-X, Enthalpy
Specific_heat

Author(s): Hasaba,S. Uemura,T.
Title: リチウム・ブロマイド水系のエンタルピー濃度線図の作成とこれを用いた考察
Title Eng: Concentration-enthalpy diagram of lithium bromide-water solutions for the designing of absorption refrigerating machines.
Source: 冷凍; Refrigeration, Vol.36, No.405, p.12-14, 1961.
Paper No.: B068 Language: Japanese
Reviewer: Japan-I Doc.type: Journal
Comment: By using a series of data measured by the authors, an enthalpy-concentration chart was prepared, while examples of cycle caluculation made by using the chart are shown.

Data No.: B068-01
Fluids: WA, LB
Category: Enthalpy, Refrigerating_machine

Author(s): Hasaba,S. Uemura,T. Narita,H.
Title: モノエチルアミン水溶液の物性値について
Title Eng: Some physical properties of monoethylamine-water solutions at various temperatures.
Source: 冷凍; Refrigeration, Vol.36, No.405, p619, 1961.
Paper No.: B071 Language: Japanese
Reviewer: Japan-I Doc.type: Journal
Comment: Shows data on viscosity and surface tension included in data obtained by a series of measurements concerning this system.

Data No.: B071-01
Fluids: EA, WA
Category: Surface_tension, Viscosity

Author(s): Hasaba,S. Uemura,T. Narita,H.
Title: リチウムブロマイド水溶液の熱力学的性質について（第２報）
Title Eng: Some thermal and physical properties of lithium bromide-water solutions for the designing of absorption refrigeration machines.
Source: 冷凍; Refrigeration, Vol.36, No.405, p4-11, 1961.
Paper No.: B072 Language: Japanese
Reviewer: Japan-I Doc.type: Journal
Comment: Measured the density, viscosity, surface tension and heat of mixing of LiBr solution.

Data No.: B072-01
Fluids: WA, LB
Category: PVT-X, Enthalpy
Surface_tension, Viscosity

Author(s): Hasaba,S. Uemura,T. Higuchi,Y,
Title: リチウム・クロライド水溶液の諸物性
Title Eng: Some physical properties of lithium chloride-water solutions for designing of absorption refrigerating machines.
Source: 冷凍; Refrigeration, Vol.39, No.441, p636, 1964.
Paper No.: B070 Language: Japanese
Reviewer: Japan-I Doc.type: Journal
Comment: Measured the physical properties of LiCl-H2O system.

Data No.: B070-01
Fluids: WA, LC
Category: PVT-X, Surface_tension
Viscosity, Thermal_conductivity

Author(s): Hasaba,S. Uemura,T. Seno,T.
Title: リチウム・ブロマイド－水系のエントロピー濃度線図の作成とそれを用いた考察
Title Eng: Concentration-Entropy diagram of lithium bromide-water solutions for the designing of absorption refrigerating machines.
Source: 冷凍; Refrigeration, Vol.39, No.441, p651, 1964.
Paper No.: B073 Language: Japanese
Reviewer: Japan-I Doc.type: Journal
Comment: Prepared an entropy-concentration chart for LiBr-H2O, and to exemplify its use, heat loss of an absoption cycle was calculated.

Data No.: B073-01
Fluids: WA, LB
Category: Others, Refrigerating_machine
Memo1: Entropy data are reported.

Author(s): Hasaba,S. Uemura,T.
Title: 水ーリチウム・アイオダイド系吸収式冷凍機の研究
Title Eng: Investigation of absorption refrigerating machine operating on solution of water and lithium iodide.
Source: 冷凍; Refrigeration, Vol.44, No.504, p891, October 1969.
Paper No.: B212 Language: Japanese
Reviewer: Japan-E Doc.type: Journal
Comment: This paper is attractive because of the authors' assertion that, differing from LiBr system which may involve crystallization, LiI can eliminate the drawback. However, as the authors concluded, it is not necessarily excellent in terms of thermodynamic characteristics evaluated, and not likely to deserve continued attention. Its material corrosiveness is also unknown.

Data No.: B212-01
Fluids: WA, LI
Category: Enthalpy, COP

Author(s): Hasaba,S. Uemura,T.
Title: メタノールーリチウム・ブロマイドージンク・ブロマイド系吸収式冷凍機の研究
Title Eng: Studies on the methanol-lithium bromide-zinc bromide absorption refrigerating machine.
Source: 冷凍; Refrigeration, Vol.44, No.502, p720, August 1969,
Paper No.: B215 Language: Japanese
Reviewer: Japan-F Doc.type: Journal
Comment: Since LiBr-CH3OH is very high in viscosity, this system has been added ZnBr2 to reduce viscosity. Concerning the physical properties, more detailed data are reported. When using methanol as refrigerant, the system has low latent heat of vaporization as a drawback, but the COP for the double-effect system is calculated to be about 1.5 (HGE120℃, LGE75℃, EVA10℃, COND30℃). Possible problems with this system are thermal stability of methanol and corrosiveness.

Data No.: B215-01
Fluids: MA1, LB, ZB
Category: PVT-X, Enthalpy
Viscosity
Conc.: LiBr:ZnBr2 = 2:1 (mol)

Author(s): Hensel,Jr. et al.
Title: United States patent compositions for absorption refrigeration system.
Source: USP 3,643,455 Feb. 22, 1972
Paper No.: A075 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings
Comment: U.S.A Patent Gazette on refrigerant/absorbent for an air-cooled absorption refrigerating machine. In the case of an air-cooled absorption refrigerating machine, the

crystallization region of absorbent becomes a problem. As a method for preventing the absorbent from crystallization, this invention claims H2O/LiI-LiBr system to which LiI is added, and a drop of crystallization temperature by adding ethylene glycol.

Author(s): Herold,K.E. Moran,M.J.
Title: Thermodynamic properties of lithium bromide/water solutions.
Source: ASHRAE Trans., Vol.93, pt.1, 1987, p35-48.
Paper No.: D279 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Presents an equation on Gibbs free energy on lithium bromide solutions.

Data No.: D279-01
Fluids: WA, LB
Category: PVT-X

Author(s): Hodgett,D.L.
Title: Summary of work on sorption heat pumps and related system.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C263 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings
Comment: Describes development of a primary energy driven absorption heat pump for domestic space heating and research on a heat pump for heat recovery from a paper dryer to generate low pressure vapor.

Author(s): Hölbling,W. Petrin,W. Schnitzer,H. Moser,F.
Title: Bewertung von Arbeitsstoffgemischen für Absorptionswärmepumpen.
Title Eng: Evaluation of working mixtures for absorption heat pumps.
Source: Ki, Klima, Kälte, Heiz., 1986, vol.14, no.1, P.19-24.
Paper No.: D066 Language: German
Reviewer: Japan-A Doc.type: Journal
Comment: The COPs of heat pumps and heat transformers were theoretically derived by using values of basic physical properties of working pairs, such as specific heat, heat of vaporization, density, working pressure difference and heat of mixing, as well as temperature efficiency showing the size of solution heat exchanger. Then, the paper showed that, by comparing with the COP values reported in other literature, the accuracy is high (with an error of -5～22.4%). Changes in COP along with changes in the size of solution heat exchanger were calculated for various refrigerant/absorber pairs.

Data No.: D066-01
Fluids: AM, WA
Category: Heat_pump, COP
Temp.: Heat source temp.: -10～ 120℃; output temp.: 40～ 155℃

Data No.: D066-02
Fluids: WA, LB
Category: Heat_pump, COP

Temp.: Heat source temp.: -10~ 120℃; output temp.: 50~ 155℃

Data No.: D066-03
Fluids: R22, DMETEG
Category: Heat_pump, COP
Temp.: Heat source temp.: -10~ 120℃; output temp.: 40~ 120℃

Data No.: D066-04
Fluids: AM, LB, WA
Category: Heat_pump, COP
Temp.: Heat source temp.: -10~ 120℃; output temp.: 40~ 155℃

Data No.: D066-05
Fluids: MA, WA, LB
Category: Heat_pump, COP
Temp.: Heat source temp.: -10~80℃; output temp.: 40~ 100℃

Data No.: D066-06
Fluids: MA1, LB
Category: Heat_pump, COP
Temp.: Heat source temp.: -10~80℃; output temp.: 40~ 120℃

Data No.: D066-07
Fluids: MA1, LB, ZB
Category: Heat_pump, COP
Temp.: Heat source temp.: -10~80℃; output temp.: 40~ 120℃

Data No.: D066-08
Fluids: WA, SH
Category: Heat_pump, COP
Temp.: Heat source temp.:10~ 120℃; output temp.: 50~ 155℃

Data No.: D066-09
Fluids: WA, SA
Category: Heat_pump, COP
Temp.: Heat source temp.:10~80℃; Output temp.: 50~ 120℃

Data No.: D066-10
Fluids: R22, DEF
Category: Heat_pump, COP
Temp.: Heat source temp.:10~80℃; Output temp.: 50~ 120℃

Author(s): Iedema,P.D.
Title: The absorption heat pump with lithium bromide/zinc bromide/methanol.
Source: WTHD-162, P.335 (1984).
Corp_src: Afd. Werktuigbouwkd. Tech. Hogesch. Delft.
Paper No.: D070 Language: English
Reviewer: Denmark Doc.type: Report

Data No.: D070-01
Fluids: MA1, LB, ZB
Category: Solubility, Enthalpy
Viscosity, Diffusion_coefficient
Pressure: 1.2-9.4 kPa
Temp.: 34-58 ℃
Conc.: 0.28-0.36

Data No.: D070-02

Fluids: AM, WA
Category: COP

Data No.: D070-03
Fluids: MA, LT
Category: COP

Data No.: D070-04
Fluids: MA, LT, ST
Category: COP

Data No.: D070-05
Fluids: MA, Glycol
Category: COP

Data No.: D070-06
Fluids: WA, LB
Category: COP

Data No.: D070-07
Fluids: MA1, LB
Category: COP

Data No.: D070-08
Fluids: R22, DMETEG
Category: COP

Data No.: D070-09
Fluids: TFE, HMPT
Category: COP

Author(s): Isshiki,N. Kamosida,J.
Title: LiCl+CaCl2/H2O Pair.
Source: Proceedings of absorption Heat Pumps Congress. Paris. March 20-22. 1985.
Paper No.: B079 Language: English
Reviewer: Japan-F Doc.type: Conference proceedings
Comment: It has been proved that power can be taken out from an absorption system. Herein lies the significance of this study.

Data No.: B079-01
Fluids: WA, LC, CC
Category: Heat_pump, Others

Author(s): Isshiki,Naotsugu Kamoshida,Junji
Title: Lithum chloride + calcium chloride/water pair.
Source: EUR-10007-EN; Comm. Eur. Communities, (Rep.) EUR (1985); Absorpt. Heat Pumps Congr., P.279-87.
Corp_src: Comm. Eur. Communities
Paper No.: D073 Language: English
Reviewer: Japan-F Doc.type: Report; Conference
Comment: Although this paper gives a detailed account of CDE (concentration difference energy) car's cycle, it contains less information about the working fluid. Probably, this paper was announced as part of a series, and may have a preceding report. Although abbreviations are used in Fig.8, the meaning is unclear.

Data No.: D073-01
Fluids: WA, LC
Category: PVT-X, Corrosiveness
Others
Memo1: Co-generation system is examined.

Data No.: D073-02
Fluids: WA, CC
Category: PVT-X, Corrosiveness
Others
Memo1: Co-generation system is examined.

Author(s): Iyoki,S. Uemura,T.
Title: 水－リチウム・クロライド系吸収式冷凍機及び調湿装置における腐食抑制剤に就いて
Title Eng: Studies on inhibitors used in the absorption refrigerators and air conditioners.
Source: 日本冷凍協会学術講演会講演論文集; Proc. JAR Annual Conf., 1979, P21-24.
Paper No.: B203 Language: Japanese
Reviewer: Japan-E Doc.type: Conference proceedings
Comment: Using SS41, Cu, SUS304 and SUS430 as samples, this paper surveys the effects of corrosion inhibitors. By using 40.3wt% LiCl solution, both continuous boiling tests and intermittent boiling tests were carried out. The paper also examined the multiplying effect produced when lithium hydroxide was added together with corrosive inhibitor. Although it offers useful data to generally grasp the effects of corrosion inhibitor, since it does not take account of pinhole, the data must be treated carefully.

Data No.: B203-01
Fluids: WA, LC, BTr
Category: Corrosiveness
Conc.: 40.3 wt%(LC) 0～0.8 wt%(C99)
Memo1: BTr:INHIBITOR

Data No.: B203-02
Fluids: WA, LC, C100
Category: Corrosiveness
Conc.: 40.3 wt%(LC), 0～0.8 wt%(C100)
Memo1: C100:INHIBITOR

Author(s): Iyoki,S. Uemura.T.
Title: 水－リチウムクロライド系吸収式冷凍機及び調湿装置に対する腐食抑制剤について
Title Eng: Corrosion inhibitor in water-lithium chloride absorption refrigerating machine and dehumidifier.
Source: 冷凍; Refrigeration, Vol.55, No.630, p353, April 1980.
Paper No.: B086 Language: Japanese
Reviewer: Japan-I Doc.type:

Author(s): Iyoki,S. Hanafusa,Y. Kosiyama,H.
Title: H2O-LiBr-LiSCN系吸収冷凍機について
Title Eng: Studies on water-lithium bromide-lithium thiocyanate absorption refrigerating machine.
Source: 冷凍; Refrigeration, Vol.56, No.646,661, August 1981.

Paper No.: B080 Language: Japanese
Reviewer: Japan-I Doc.type: Journal
Comment: (1) By measuring the physical properties of H2O-LiBr-LiSCN, an enthalpy-concentration chart was prepared. LiBr and LiSCN were mixed equimolarly. Absorbent (LiBr+LiSCN) concentration is expressed in wt%. As a result of simulation, it was found that, compared with H2O-LiBr system, this system has a wider working range.

Data No.: B080-01
Fluids: WA, LB, LT
Category: Enthalpy, Viscosity
Refrigerating_machine
Conc.: LiBr:LiSCN = 1:1 (mol)

Author(s): Iyoki,S. Uemura,T.
Title: H2O-LiBr-LiSCN系吸収冷凍機に関する腐食抑制剤について
Title Eng: Corrosion inhibitor in water-lithium bromide-lithium thiyocyanate absorption refrigerating machine.
Source: 冷凍; Refrigeration, Vol.56, No.646,687, August 1981.
Paper No.: B085 Language: Japanese
Reviewer: Japan-I Doc.type: Journal
Comment: As corrosion inhibitors with LiBr-LiSCN solution as absorbent, the following three types are recommended: (1) COBRATEC99 0.1~0.2wt% (LiOH not added), (2) COBRATEC100 inthe vicinity of 0.2wt% (LiOH not added), and (3) lithium nitrate 0.2~0.3 wt%. All these are more effective when LiOH is not added. Mainly tested on mild steel (SS41) and copper specimen.

Data No.: B085-01
Fluids: WA, LB, LT, BTr
Category: Corrosiveness
Conc.: 0.1~0.2wt% (BTr)
Memo1: BTr:INHIBITOR

Data No.: B085-02
Fluids: WA, LB, LT, C100
Category: Corrosiveness
Conc.: 0.2wt% (C100)
Memo1: C100:INHIBITOR

Data No.: B085-03
Fluids: WA, LB, LT, LNT
Category: Corrosiveness
Conc.: 0.2~0.3wt% (LNT)
Memo1: LNT:INHIBITOR

Author(s): Iyoki,S. Uemura,T.
Title: 水ーリチウムブロマイドーエチレングリコール系吸収冷凍機について
Title Eng: Studies on the water-lithium bromide-ethylene glycol absorption refrigerating machine.
Source: 冷凍; Refrigeration, Vol.56, No.642, p279, April 1981.
Paper No.: B089 Language: Japanese
Reviewer: Japan-I Doc.type: Journal
Comment: By measuring the physical properties of water-lithium bromide-ethylene glycol system, an enthalpy- concentration

chart was prepared. Ethylene glycol mixing ratio is 0.1 mol to 1 mol of water, and lithium bromide concentration in the chart is expressed in wt% in ethylene glycol solution. The paper also gives some cycle calculations using this system.

Data No.: B089-01
Fluids: WA, LB, EG
Category: PVT-X, Solubility
Enthalpy
Conc.: WA:EG = 1:0.1 (mol)

Author(s): Iyoki,S. Koshiyama,H. Uemura,T.
Title: H2O-LiBr-C4H6O2系吸収冷凍機について
Title Eng: Studies on H2O-LiBr-C4H6O2 absorption refrigerators.
Source: 日本冷凍協会学術講演会講演論文集; Proc. JAR Annual Conf., 1981, P13-16.
Paper No.: B200 Language: Japanese
Reviewer: Japan-E Doc.type: Conference proceedings
Comment: Measured the physical property values of a ternary system proposed as refrigerant-absorbent for low temperature heat source absorption refrigerating machines. Viscosity of 40wt% solution is 2 times and 1.3 times as high as those of H2O-LiBr system and H2O-LiBr-LiSCN system, respectively. Thus, it must be treated a little carefully. Also, compared with H2O-LiBr system, solubility is lower than 10% in the practical temperature range, so the service temperature range may narrow.

Data No.: B200-01
Fluids: WA, LB, BL
Category: PVT-X, Specific_heat
Viscosity

Author(s): Iyoki,S. Kasiyama,H. Uemura,T.
Title: H2O-LiBr-C4H6O2 系吸収式冷凍機に対する腐食抑制剤について.
Title Eng: Inhibitors used for the H2O-LiBr-C4H6O2 absorption refrigerators.
Source: 第16回空気調和・冷凍連合講演会論文集; Proc. 16th Air-cond. Refrig. Conf. Japan, 1982, P101-104.
Paper No.: B081 Language: Japanese
Reviewer: Japan-I Doc.type: Conference proceedings
Comment: By conducting a corrosion test on a ternary system made by adding C4H6O2 (5% of H2O) to LiBr-H2O system, the following results were obtained: (1) Corrosion is inhibited when LiOH is added to the solution and PH is made neutral or alkaline. (2) As inhibitors to this system, COBRATEC99 (LiOH added), COBRATEC100 (LiOH added) and Li2(Mo7O24)12H2O(LiOH added) are effective.

Data No.: B081-01
Fluids: WA, LB, BL, BTr
Category: Corrosiveness
Memo1: BTr:INHIBITOR

Data No.: B081-02
Fluids: WA, LB, BL, C100
Category: Corrosiveness
Memo1: C100:INHIBITOR

Data No.: B081-03
Fluids: WA, LB, BL, LM
Category: Corrosiveness
Memo1: LM:INHIBITOR

Author(s): Iyoki,S. Koshiyama,H. Uemura,T.
Title: C2H5OH-LiI系吸収冷凍機の研究 －物理的および熱的性質の研究－
Title Eng: Studies on ethanol-lithium iokide absorption refrigerating machine-measurements of physical and thermal properties.
Source: 冷凍; Refrigeration, Vol.57, No.662, p1183, December 1982.
Paper No.: B082 Language: Japanese
Reviewer: Japan-I Doc.type: Journal
Comment: By measuring the physical properties of C2H5OH-LiI system, an enthalpy-concentration chart was prepared. Compared to other systems with alcohol as refrigerant, this system is low in vapor pressure and high in solubility. So, the paper expects that it is promising.

Data No.: B082-01
Fluids: EAl, LI
Category: PVT-X, Enthalpy
Specific_heat

Author(s): Iyoki,S. Kosiyama,H. Uemura,T.
Title: H2O-LiBr-C4H6O2 系吸収冷凍機の研究 －第一報 諸物性の測定－
Title Eng: Studies on the water-lithium bromide-butyrrolactone absorption refrigerating machine-measurements of the properties.
Source: 冷凍; Refrigeration, Vol.58, No.665, March 1983.
Paper No.: B083 Language: Japanese
Reviewer: Japan-I Doc.type: Journal
Comment: By measuring the physical properties of H2O-LiBr-C4H6O2, an enthalpy-concentration chart of liquid phase was prepared. Incidentally, the concentration of C4H6O2 in the vapor phase is not negligible. Since gas-liquid equilibrium relations are not measured, a vapor phase enthalpy chart is not yet prepared. C4H6O2 mixing ratio is 0.05 mol constant to 1mol of water, and concentration in the chart is shown by wt% of LiBr. Although this system is more advantageous than H2O-LiBr system in that the vapor pressure is low, the working range narrows a little.

Data No.: B083-01
Fluids: WA, LB, BL
Category: PVT-X, Enthalpy
Specific_heat
Conc.: WA:BL = 1:0.05 (mol)

Author(s): Iyoki,S. Uemura,T.
Title: H2O-LiBr-ZnCl2系吸収冷凍機について （第2報）
Title Eng: H2O-LiBr-ZnCl2 absorption refrigerators.
Source: 第17回空気調和・冷凍連合講演会講演論文集; Proc. 17th Air-Cond. Refrig. Conf. Japan,p152, April 1983.
Paper No.: B195 Language: Japanese
Reviewer: Japan-E Doc.type: Conference proceedings
Comment: Takes up the ternary H2O-LiBr-ZnCl2 system as a refrigerant-absorbent system for an absorption refrigerating

machine which is suitable for utilization of low temperature heat source, and can serve in air-cooled systemization of a refrigerating machine, or allow it to operate as a heat pump. Based on the enthalpy-concentration chart derived, theoretical performance and working characteristics of the system used in single-stage, two-stage or double-effect refrigerating machines were examined. As a result, it is suggested that the single-stage type is advantageous in that it is higher in COP and wider in working range than H2O-LiBr system, and that the system, when used in the single-stage type, is workable even in a region where consideration temperature is high, thus being promising as a system to be used in air-cooled or heat pump systemization of a refrigerating machine.

Data No.: B195-01
Fluids: WA, LB, ZC
Category: Enthalpy, Refrigerating_machine
COP

Author(s): Iyoki,S. Koshiyama,H. Uemura,T.
Title: Water-lithium bromide-butyrolactone absorption refrigerating machine.
Source: I.R.J. Oct-Dec. 1984. p.9.
Paper No.: B084 Language: English
Reviewer: Japan-I Doc.type:

Author(s): Iyoki,S. Uemura,T.
Title: H2O-LiBr-C4H6O2 系吸収冷凍機の研究
Title Eng: Water-lithium bromide-γ-butyrolactone absorption refrigerating machine.
Source: 日本冷凍協会論文集; Trans. JAR, Vol.3, No.1, 1986, p27-33.
Paper No.: D225 Language: Japanese
Reviewer: Japan-J Doc.type: Journal
Comment: In the case of H2O-LiBr-C4H6O2 absorption refrigerating machines, corrosion is inhibited when the pH value of the solution is made neutral or alkarine. Found BTr, C100, and LM to be effective inhibitors.

Data No.: D225-01
Fluids: WA, LB, BL, BTr
Category: Corrosiveness

Data No.: D225-02
Fluids: WA, LB, BL, C100
Category: Corrosiveness

Data No.: D225-03
Fluids: WA, LB, BL, LM
Category: Corrosiveness

Author(s): Iyoki,S. Uemura,T.
Title: 水－リチウム・ブロマイド系吸収式冷凍機における腐蝕抑制剤の研究
Title Eng: Studies on corrosion inhibitor in water-lithium bromide absorption refrigerating machines.

Source: 冷凍; Refrigeration, Vol.53, No.614, p3, December 1978.
Paper No.: B087 Language: Japanese
Reviewer: Japan-I Doc.type: Journal
Comment: As corrosion inhibitors for LiBr-H2O system which can substitute for lithium chromate, (1) Li2(Mo7O24)12H2O, (2) COBRATEC99 and (3) COBRATEC100 are named, since these probed very effective in the continues boiling and intermittent boiling tests.

Data No.: B087-01
Fluids: WA, LB, LM
Category: Corrosiveness
Memo1: LM:INHIBITOR

Data No.: B087-02
Fluids: WA, LB, Btr
Category: Corrosiveness
Memo1: BTr:INHIBITOR

Data No.: B087-03
Fluids: WA, _LB, C100
Category: Corrosiveness
Memo1: C100:INHIBITOR

Author(s): Jain,P.C. Gable,G.K.
Title: Equilibrium property data equations for aqua-ammonia mixtures.
Source: ASHRAE Trans, No.2180, 1971.
Paper No.: B090 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Macriss data (literature No.A111) were turned into numerical formulas.

Data No.: B090-01
Fluids: AM, WA
Category: PVT-X, Enthalpy
Pressure: 1.72~2.41MPa,0.34~0.55MPa

Author(s): Jelinek,M. Borde,I. Yaron,I.
Title: Enthalpy-concentration diagram of the system R22-dimethyl formamide and performance characteristics of refrigeration cycle operating with this system.
Source: ASHRAE Trans., Vol.84, 1978, p60-67.
Paper No.: D267 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: By preparing enthalpy-concentration diagram of the system R22-DMF, refrigeration cycle were analyzed, thereby showing that the system can realize a higher COP and lower solution circulation ratio than the system R22-DMETEG.

Data No.: D267-01
Fluids: R22, DMF
Category: PVT-X, Refrigerating_machine

Author(s): Jelinek,M. Yaron,I. Borde,I.
Title: Measurement of vapor-liquid equilibra and determination of enthalpy-concentration diagrams of refrigerant-absorvent

combinations.
Source: IIF-IIR Congress, commissions B1,B2,E1,E2, Mons. (Belgium) 1980.
Paper No.: C091 Language: English
Reviewer: Japan-J Doc.type: Conference proceedings
Comment: (1) By measuring the gas-liquid equilibrium relations of R22-DMETEG system, a concentration-enthalpy chart has been prepared. (2) Measuring accuracy: temperature ±0.3℃, pressure ±6.9kPa.

Data No.: C091-01
Fluids: R22, DMETEG
Category: PVT-X, Enthalpy
Pressure: 0.98~19.6bar
Temp.: 0~120℃

Author(s): Kashiwagi,T. Kurosaki,Y. Nikai,I.
Title: 臭化リチウム水溶液中への水蒸気吸収過程における熱及び物質拡散
Title Eng: Heat and mass diffusions in the absorption of water vapor by aqueous solution of lithium bromide.
Source: Trans. JAR, Vol.1, No.1, p89-98, 1984.
Paper No.: B096 Language: Japanese
Reviewer: Japan-J Doc.type: Journal
Comment: (1) Mutual diffusion coefficient of lithium bromide solution was obtained by utilizing the holography real time interference method. (2) It is very significant that the mutual diffusion coefficient has been measured actually.

Data No.: B096-01
Fluids: WA, LB
Category: Diffusion_coefficient
Temp.: 298±1.5K
Conc.: 20~60wt%(LiBr)

Author(s): Kashiwagi,T.
Title: 高性能吸収器における界面活性剤の役割と吸収促進
Title Eng: The activity of surfactant in high-performance absorber and absorption enhancement.
Source: 冷凍; Refrigeration, Vol.60, No.687, p72-79, January 1985.
Paper No.: B094 Language: Japanese
Reviewer: Japan-J Doc.type: Journal
Comment: Gives a generalized account of roles of surface active agents in absorption.

Data No.: B094-01
Fluids: WA, LB, OA1
Category: Absorber_(Absorption), Others

Author(s): Kashiwagi,T. Okajima,G.
Title: アンモニア蒸気吸収過程における物質拡散
Title Eng: Mass diffusion in the process of ammonia vapor absorption in NH3-H2O-LiBr ternary system.
Source: 第24回日本伝熱シンポジウム講演論文集; Proc. 24th National Heat Transfer Symp. Japan, 1987, p501-503.
Paper No.: D229 Language: Japanese
Reviewer: Japan-J Doc.type: Conference
Comment: By measuring the mass diffusion coefficients of binary

system (NH3-H2O) and ternary system (NH3-H20-LiBr) solutions with the holography real time interference method, revealed that dissolution of LiBr significantly drops the mass diffusion.

Data No.: D229-01
Fluids: AM, WA
Category: Diffusion_coefficient, Absorber_(Absorption)

Data No.: D229-02
Fluids: AM, WA, LB
Category: Diffusion_coefficient, Absorber_(Absorption)

Author(s): Kashiwagi,T. Asawa,Y.
Title: ＬｉＳＣＮアンモニア溶液中へのアンモニア蒸気吸収過程における物質拡散
Title Eng: Mass diffusion in the process of absorption of ammonia vapor in ammonia-LiSCN solution.
Source: 日本冷凍協会学術講演会論文集; Proc. JAR Annual Confer., 1987, p105-108.
Paper No.: D242 Language: Japanese
Reviewer: Japan-J Doc.type: Conference
Comment: Revealed that LiSCN, solid alkaline salt as an absorbent, is thermodynamically more favorable than NaSCN, as it lowers the saturated vapor pressure. From the point of view of mass transfer, however, it has a drawback in that it lowers the mass diffusion coefficient, and gave molecular theoretical considerations thereto.

Data No.: D242-01
Fluids: AM, LT
Category: Diffusion_coefficient
Temp.: 297K
Conc.: 0.47 - 0.55 mass fraction of NH3

Author(s): Keller,J.U.
Title: R&D work on heat transformations by absorption processes.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C264 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings
Comment: (1) Recovering industrial waste heat: a H2SO4/H2O absorption heat pump boosts waste heat at 50℃ to saturated vapor at 2bar. (2) Low temperature absorption heat pump: a LiBr/H2O absorption heat pump was build to test absorption process at below 1 bar and 0～100℃, and to study thermodynamic and chemical stability of LiBr/H2O containing well defined impurities. (3) Thermodynamic data: enthalpy, heat capacity, etc. of NH3/H2O/LiBr system are obtained.

Author(s): Kirilyuk,S.S. Lavrishin,B.N. Fedin,I.M. Lyashenko,A.F.
Title: Influence of certain inhibitors on the protection of steel from corrosion in a mixture of acids.
Source: Sov. Mater. Sci. (USA), Vol.20, No.2, P.91-4, Trans.P.179-82, March-April 1984.
Paper No.: D085 Language: English

Reviewer: Japan-C Doc.type: Journal
Comment: (1) In the current research and experiment, the corrosion inhibiting effect of 20 Steel in an acid(10%HCl+ 3%H3PO4+1%HNO3) was found to come in the order of KhOSP-10>I-I-V>PKU-M>BA-6>S-5. (2) KhOSP-10 and its compound exhibited the most effective corrsion inhibiting characteristics in both the static acid state and fluid acid state. (3) This paper discusses salt deposits on ordinary heat exchangers, etc., or inhibitors for chemical cleaning of rust, etc., and the contents do not seem to have direct relations with absorption refrigerating machines.

Author(s): Koebel,M. Aegerter,A.
Title: Die thermische Stabilität von Methanol und des ternären Systems Methanol-Lithiumbromid-Zincbromid.
Title Eng: The thermal stability of methanol and the ternary system methanol-lithiumbromide-zincbromide.
Source: Ki-extra. Vol.14. No.50. 1981.
Paper No.: B100 Language: German
Reviewer: Japan-A Doc.type: Journal
Comment: The results agree to well with general tendencies. The measuring method is very ordinary. Specifies the operating limit temperature to be 100~130℃.

Data No.: B100-01
Fluids: ML, LB, ZB
Category: Stability
Pressure: 10~3800Pa
Temp.: 100~200℃
Conc.: 28mass%(methanol)

Author(s): Koshiyama,H. Hanabusa,Y. Iyoki,S. Uemura,T.
Title: H2O-LiBr-LiSCN系吸収式冷凍機に関する研究 (第一報)
Title Eng: Studies on H2O-LiBr-LiSCN absorption refrigerators.
Source: 日本冷凍協会学術講演会講演論文集; Proc. JAR Annual Conf., 1980.
Paper No.: B201 Language: Japanese
Reviewer: Japan-E Doc.type: Conference proceedings
Comment: Takes up H2O-LiBr-LiSCN system as a refrigerant-absorbent pair for solar heat source absorption refrigerating machines, and measures the physical property values. It is more viscous than the H2O-LiBr system, and has nearly two times as high as the H2O-LiBr system at operating temperature. Thus, in designing an absorption refrigerating machine with this system, care will be necessary for the liquid dispersion system, etc. Accuracy of experiment itself and experimental formula is unknown.

Data No.: B201-01
Fluids: WA, LB, LT
Category: PVT-X, Specific_heat
Viscosity

Author(s): Koutsoukos,P.G. Kontoyannis,C.G.
Title: Prevention and inhibition of calcium carbonate scale.
Source: J. Cryst. Growth (Netherlands), vol.69, no.2-3, P.367-76,

Nov. 1984.
Paper No.: D088 Language: English
Reviewer: Denmark Doc.type: Journal
Comment: Inhibition of calcium carbonate scale in boilers.

Data No.: D088-01
Fluids: WA, DDPE
Category: Corrosiveness

Author(s): Kriebel,M. Löffler,H.J.
Title: Thermodynamische Eigenschaften des binären Systems Difluormonochlormethan (R22)-Tetraäthyle nglykoldimethyläther (E181).
Title Eng: Thermodynamic properties of the binary system R22/E181.
Source: Kältetechnik, 17-9, 1963, p266-271.
Paper No.: C101 Language: German
Reviewer: Japan-J Doc.type: Journal

Data No.: C101-01
Fluids: R22, DMETEG
Category: PVT-X, Solubility
Enthalpy, Specific_heat
Pressure: 0.1~20at
Temp.: -40~70℃
Conc.: 0~100%

Author(s): Kueper,P. Loffler,H.J.
Title: Eine neue Dampftafel für das Kältemittel R22.
Title Eng: A new table of thermodynamic properties for the refrigerant 22.
Source: Kältechnik-Klimatisierung, Vol.23, 1971.2, p47-51.
Paper No.: C102 Language: German
Reviewer: Japan-J Doc.type: Journal
Comment: Since this paper offers data on the physical properties of R22, data will be unnecessary.

Data No.: C102-01
Fluids: R22
Category: PVT-X, Enthalpy

Author(s): Lange,E Schwartz,E.
Title: Lösungs- und Verdünnungswärmen von Salzen von der äussersten Verdünnung bis zur Sättigung. IV Lithiumbromid.
Title Eng: Solution and dilution heat of salts from utmost dilution to the saturation limit
Source: Z. Physikal Chem., Vol.133, 1927, P129.
Paper No.: D186 Language: German
Reviewer: Japan-F Doc.type: Jounal
Comment: A classic paper on measurement of heat of solution and heat of dilution. It seems that LiBr was taken up not specially for heat pump use, but because of academic interest.

Data No.: D186-01
Fluids: WA, LB
Category: Enthalpy, Specific_heat
Others
Pressure: Atmospheric pressure

Temp.: 25℃
Conc.: 0%～saturation concentration
Memo1: Heat of solution and heat of dilution are presented.

Author(s): Latyshev,V.P.
Title: Experimental investigation of the heat capacity of didutyl phytalate and dimethyl ether of tetreethylene glycol and of their heats of mixing.
Source: Khol. Tekhn. 46(8). 31-34. 1969.
Paper No.: B104 Language: Russian
Reviewer: Japan-E Doc.type:

Author(s): Li-Ting Chen Rong-Fung Huang
Title: The cycle analysis of a R-22/DMF absorption refrigeration system. 1. The solubility of R-22 in DMF.
Source: Int. Commun. Heat & Mass Transfer (GB), vol.12, no.6, P.737-42, Nov.-Dec. 1985.
Paper No.: D094 Language: English
Reviewer: Japan-F Doc.type: Journal
Comment: (1) Formulated an approximation equation for P-T-X relations, which will be convenient for grasping the vapor pressure. (2) There is a small difference between the vapor pressures obtained from the approximation equation and the measurement.

Author(s): Lloyd,E. Brown,C.B. Bonnell,D.G.R. Jones,W.J.
Title: Equilibruim between alcohols and salts. Part 2.
Source: I. Chem. Sac, 1928, p658-666.
Paper No.: C108 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Solubility of salt into ethanol and methanol. Old data - will be unnecessary.

Author(s): Macriss,R.A. Punwai,D. Rush,W.F. Biermann,W.J.
Title: Thermodynamic and physical properties of Monomethylamine-litium thiocyanate system.
Source: Inst.of Gas Tecnology, Chicago. 3. 60616.
Paper No.: C118 Language: English
Reviewer: Japan-H Doc.type:

Author(s): Macriss,R.A. Eakin,B.E. Ellington,R.T. Huebler,J.
Title: Physical and thermodynamic properties of ammonia-water mixtures.
Source: Inst.Gas.Technol. Chicago,Res.Bull. No.34. 1964.
Paper No.: A111 Language: English
Reviewer: Japan-H Doc.type: Report
Comment: This paper reports on the vapor pressure and enthalpy of ammonia-water system measured at IGT. It also compares the results with the values of experiments and calculations made in the past.

Data No.: A111-01

Fluids: AM, WA
Category: PVT-X, Enthalpy
Pressure: 0～2.1MPa
Temp.: 0～200℃
Conc.: 0～100 wt%

Author(s): Macriss,R.A. Mason,D.M.
Title: Physical and thermodynamic Properties of New Refrigerant-Absorbant Pairs.
Source: Project ZB-85 Final Report prepared for the Air Conditioning and Prime Mover Research Committee of the American Gas Association. Institute of Gas Tecnology. October,1964.
Paper No.: A112 Language: English
Reviewer: Japan-H Doc.type:

Author(s): Macriss,R.A. Weil,S.A. Rush,W.F. (assigned to America n Gas Association).
Title: Absorption refrigeration system containing solutions of monomethylamine with thiocyanate.
Source: U.S.Patent. 3,458,445. 1969 July 29.
Paper No.: A113 Language: English
Reviewer: Japan-H Doc.type: Patent
Comment: Discovered that methylamine-sodium thiocyanate system is a working pair having characteristics favorable for an air-cooled absorption refrigeration system.

Data No.: A113-01
Fluids: MA, ST
Category: PVT-X

Author(s): Macriss,R.A. Punwani,D. Rush,W.F. Biermann,W.J.
Title: Thermodynamic and physical properties of monomethylamine-lithium thiocyanate system.
Source: J.Chem.Eng.Data, Vol.15, No.4, p466-470, 1970 October.
Paper No.: A114 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: (1) Measured the vapor pressure, liquid viscosity and liquid density of monomethylamine-lithium thiocyanate system, and estimated the latent heat of vaporization. (2) Methylamine contains 0.11mol% of trimethylamine, 0.6mol% of dimethylamine and 0.37mol% of ammonia as impurities. Water content of lithium thiocyanate is less than 1%.

Data No.: A114-01
Fluids: MA, LT
Category: PVT-X, Enthalpy
Viscosity
Pressure: vapor pressure:0.069～13.8bar
Temp.: viscosity:24～93℃
Conc.: vapor pressure:0～56wt%(LiSCN); viscosity:56wt%(LiSCN)

Author(s): Macriss,R.A. Rush,W.F.
Title: Lithium bromide-lithium thiocyanate-water compositon for an absorbent-refrigeration system.

Source: U.S.Patent. 3,541,013. 1970 November 17.
Paper No.: A115 Language: English
Reviewer: Japan-H Doc.type: Patent
Comment: Discovered that LiBr/LiSCN/H2O system is a working fluid having characteristics favorable for an air-cooled absorption refrigeration system. This system has high solubility and low viscosity, compared with LiBr/H2O.

Data No.: A115-01
Fluids: WA, LB, ST
Category: PVT-X

Author(s): Macriss,R.A. Punwani,D. Rush,W.F. Biermann,W.J.
Title: Thermodynamic and physical properties of the ammonia-lithium thiocyanate system.
Source: J. Chem. Eng. Data, 1972 December.
Paper No.: A116 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Measured vapor pressure, liquid viscosity and liquid density of ammonia-lithium thiocyanate, and estimated the latent heat of vaporization.

Data No.: A116-01
Fluids: AM, LT
Category: PVT-X, Viscosity
Pressure: vapor pressure:1.0～13.8bar
Temp.: viscosity:24～93℃
Conc.: vapor pressure:40～60wt%(LiSCN), viscosity:60wt%(LiSCN)

Author(s): Macriss,R.A.
Title: Selecting refrigerant-absobent fluid systems for solar energy utilization.
Source: Paper presented at the ASHRAE Semiannual Meeting. Dallas, Texas, February 1976.
Paper No.: A117 Language: English
Reviewer: Japan-D Doc.type: Conference proceedings
Comment: Discusses a system suitable for the solar heat powered air-cooled absorption refrigerating machine, and finds that LiBr-LiSCN-H2O system is eligible, but a little problematical with liquid viscosity. Its crystallization characteristics can be improved. LiBr-LiSCN-H2O must be evaluated as a system for direct-fired double-effect machines.

Data No.: A117-01
Fluids: R21, EG, DEG, TrEG, TEG
Category: Solubility
Pressure: 84.8kPa
Temp.: 32.2℃
Memo1: mole fraction of R21: 0.05～0.7; molar weight of absorbent : 60～340

Data No.: A117-02
Fluids: WA, LB, BL
Category: PVT-X
Pressure: 40～13.33kPa
Temp.: 30～84℃

Conc.: LB:0~100%, BL:0~100%

Data No.: A117-03
Fluids: WA, LB, LT
Category: PVT-X
Pressure: 8~13.33kPa
Temp.: 5~65℃
Conc.: LB:53~63%

Data No.: A117-04
Fluids: WA, LB, LT
Category: Solubility
Temp.: 0~93℃
Conc.: LT/LB (mol): 0, 0.25, 1.00, 4.00, ∞; mole fraction:0.23~0.43

Data No.: A117-05
Fluids: AM, WA, ST
Category: COP
Pressure: condenser:2.037MPa; evaporator:0.634MPa
Temp.: generator: 121.1℃; absorber, condenser:48.9℃; evaporator: 10℃
Conc.: 0.488(rich solution)

Data No.: A117-06
Fluids: MA, ST
Category: COP
Pressure: condenser:0.784MPa; evaporator:0.218MPa
Temp.: generator: 121.1℃; absorber, condenser:48.9℃; evaporator: 10℃
Conc.: 0.679(rich solution), 0.583(weak solution)

Data No.: A117-07
Fluids: R22, DMETEG
Category: COP
Pressure: condenser:2.013MPa, evaporator:0.719MPa
Temp.: generator: 121.1℃, absorber, condenser:48.9℃, evaporator: 10℃
Conc.: 0.470(rich solution), 0.300(weak solution)

Data No.: A117-08
Fluids: R31, DMETEG
Category: COP
Pressure: condenser:0.627MPa, evaporator:0.200MPa
Temp.: generator: 121.1℃, condenser, absorber:48.9℃, evaporator: 10℃

Author(s): Macriss,Robert A.
Title: Absorption fluids data survey.
Source: EUR-10007-EN; Asorpt. Heat Pumps Congr., P.71-8, 1985.
Corp_src: Comm. Eur. Communities
Paper No.: D100 Language: English
Reviewer: Japan-J Doc.type: Report;Conference
Comment: Explains about the policy for, present state, problems and future outlook of data research on working fluids for absorption machines being carried out at IGT. No data.

Author(s): Malewski,W.
Title: Absorption heat pumps for high temteratures and industrial application.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C266 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings
Comment: (1) Demonstration test results are reported for absorption heat pumps which were incorporated into industrial processes between 1977 and 1980. Hot water higher than 100℃ was obtained. The ratio of output temperature to heat source water temperature was 1.4～1.7. (2) Use of additive and increased rate of temperature rise under double-effect operation are planned.

Author(s): Manago,A. Ohuchi,Y. Nonaka,H.
Itoh,S. Yamasita,H.
Title: Development of a gas-fired absorption heat pump.
Source: Research center, Osaka Gas Company, Ltd., Japan. 1984. presented at International Gas Research Conference.
Paper No.: B119 Language: English
Reviewer: Japan-C Doc.type: Conference proceedings
Comment: Describes the thermal properties (PTX, density, viscosity, enthalpy), corrosiveness and estimated performance of LiBr/ZnCl2/H2O, a working fluid obtained by improving LiBr/H2O.

Data No.: B119-01
Fluids: WA, LB, ZC
Category: PVT-X, Enthalpy
Viscosity
Pressure: PTX:101kPa(1atm)
Temp.: PTX:50～ 200℃; density:20～ 180℃; viscosity:20～80℃; en thalpy:0～75℃; corrosiveness:200, 250℃
Conc.: PTX:70～80%; density:60～80%; viscosity:60～80%; enthal py: 60～75%; corrosiveness:75%

Author(s): Mastrangelo,S.V.R.
Title: Solubility of some chlorofluorohydrocarbons in tetraethyleneglycaldimethyether.
Source: ASHRAE JOURNAL,OCTOBER 1959, P64～P68
Paper No.: C120 Language: English
Reviewer: Japan-G Doc.type: Journal
Comment: Measured solubility of CFC refrigerants (R21, R22, R31, R134, R124) for absorbent E181 at various temperature and pressure, and compared the results with calculated values (Tables 1 to 4). Furthermore, heat of mixing was obtained by means of simulation (Table 5). The measuring accuracy of vapor pressure was ±0.2psig at 15psig, and ±10% for heat of mixing.

Data No.: C120-01
Fluids: R21, DMETEG
Category: PVT-X, Solubility
Heat_pump
Pressure: 4.6kPa～0.15MPa
Temp.: 27～40℃
Conc.: 14～84 mol%(Refrigerant)

Data No.: C120-02
Fluids: R22, DMETEG
Category: PVT-X, Solubility
Heat_pump
Pressure: 34kPa～2.1MPa
Temp.: 28～177℃
Conc.: 8～81mol%(Refrigerant)

Data No.: C120-03
Fluids: R31, DMETEG
Category: PVT-X, Solubility
Heat_pump
Pressure: 0.15MPa～0.90MPa
Temp.: 35～77℃
Conc.: 10～68mol%(Refrigerant)

Data No.: C120-04
Fluids: R134, DMETEG
Category: PVT-X, Solubility
Heat_pump
Pressure: 28kPa～0.50MPa
Temp.: 28～80℃
Conc.: 13～74mol%(Refrigerant)

Data No.: C120-05
Fluids: R124, DMETEG
Category: PVT-X, Solubility
Heat_pump
Pressure: 55kPa～0.84MPa
Temp.: 35～177℃
Conc.: 9～74mol%(Refrigerant)

Author(s): Matsuda,A. Munakata,T. Yoshimaru,T.
Kubota,T. Fuchi,H.
Title: 臭化リチウム水溶液の蒸気圧の測定
Title Eng: Measurement of vapor pressures of lithium bromide-water solutions.
Source: 化学工学論文集; Kagaku Kogaku Ronbunshu, 1980, (612) p119-122.
Paper No.: B122 Language: Japanese
Reviewer: Japan-J Doc.type: Journal
Comment: (1) By measuring the vapor pressure of lithium bromide solution, a correlation equation was formulated. (2) There was no difference between vapor pressures containing a very small amount of lithium chromate as a corrosion inhibitor and not containing it at all.

Data No.: B122-01
Fluids: WA, LB
Category: PVT-X
Pressure: 67～6670Pa
Temp.: 0～70℃
Conc.: 45～60wt%(LiBr)

Data No.: B122-02
Fluids: WA, LB, LCr
Category: PVT-X
Temp.: 0～70℃
Conc.: 45～55wt%(LiBr), 0.22wt%(Li2CrO4)

Author(s): Matsusita,
Title: Method of Enthalpy Determination.
Source: Tokyo Gas Company. 1985.
Paper No.: B124 Language: English
Reviewer: Japan-H Doc.type:

Author(s): McLinden,M.O. Radermacher,R.
Title: AN EXPERIMENTAL COMPARIOSON OF AMMONIA-WATER AND AMMONIA-WATER-LITHIUM BROMIDE MIXTURES IN AN ABSORPTION HEAT PUMP.
Source: ASHRAE Trans., Vol.91, pt2B, (1985), 1837-1846.
Corp_src: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE)
Paper No.: D105 Language: English
Reviewer: Japan-A Doc.type: Report
Comment: The performance of an absorption heat pump operating with ammonia-water-lithium bromide and ammonia-water mixtures is compared. The following findings were derived: (1) The COP with a ternary mixture is lower by 0.05 on the average than with a binary mixture. (2) There are only a little difference in most of pressure, pump power and temperature. (3) The concentrations of water in the rectifier's outlet refrigerant vapor are the same. With the installation of the rectifier, the COP drops, and the larger the rectifier capacity, the larger the COP drop. It is desirable that the COPs be compared with the cases in which appropriate rectifiers are installed in both ammonia-water-lithium bromide system and ammonia-water system.

Data No.: D105-01
Fluids: AM, WA
Category: Heat_pump, COP
Temp.: Ambient air:-8℃, 8℃
Conc.: 0.119,0.174 (Strong Sol., NH3 mole Fraction)

Data No.: D105-02
Fluids: AM, WA, LB
Category: Heat_pump, COP
Temp.: -8℃, 8℃
Conc.: (0.159,0.203), (0.202/0.206, 0.246/0.249) (Strong sol., NH 3 mole Fraction)
Memo1: LiBr/H2O: 0.38/0.62, 0.48/0.52 (mass fraction)

Author(s): McNeely,L.A.
Title: Thermodynamic properties of aqueous solutions of litium bromide.
Source: ASHRAE Trans., vol.85, part 1, 1979.
Paper No.: A125 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: The original of thermodynamic properties of lithium bromide solution in 1977 ASHRAE Handbook of Fundamentals.

Data No.: A125-01
Fluids: WA, LB
Category: PVT-X, Enthalpy
Temp.: 10~180℃
Conc.: 0~70wt%(LiBr)

Author(s): Meeks,A.C. Goldfarb,I.J.
Title: Vapor pressure of fluoroalcohols.
Source: J. of Chem. and Eng. Data, 1976, p196.
Paper No.: C126 Language: English
Reviewer: Japan-J Doc.type: Journal

Data No.: C126-01
Fluids: TFE
Category: PVT-X
Temp.: 0～25℃

Data No.: C126-02
Fluids: PFP
Category: PVT-X
Temp.: 0～23℃

Data No.: C126-03
Fluids: HFB
Category: PVT-X
Temp.: 0～25℃

Author(s): Mehl,W.
Title: Ein Übersichtsdiagramm log P-1/T für das Stoffpaar Methylamin-Wasser.
Title Eng: A vapor pressure diagram of Methylamine-water system.
Source: Zeitschrift Kälte-Ind., vol.42, (1935), p13.
Paper No.: C127 Language: German
Reviewer: Japan-J Doc.type: Journal
Comment: (1) Methylamine-water is a cheap working fluid and lower in pressure and toxicity than ammonia. (2) Pigeonholed the data by Felsing and Thomas (Ind. Eng. Chem., 21 (1929), p1269).

Data No.: C127-01
Fluids: MA, WA
Category: PVT-X
Pressure: 20～810kPa
Temp.: -30～160℃

Author(s): Mindyuk,A.K. Savitskata,O.P. Tkach,A.D.
Title: Protection of steel from acid corrosion, hydrogen absorption, and corrosion-mechanical failure with the use of urotropin and mixtures and derivatives of it.
Source: Sov. Mater. Sci. (USA), vol.20, no.2, P.86-91, Trans.P.172-9, March-April 1984.
Paper No.: D110 Language: English
Reviewer: Japan-C Doc.type: Journal
Comment: (1) KI-1,V-2 and BA6 powerfully protect steel from acid corrsion, hydrogen absorption and mechanical failure by corrosion in solutions of sulfuric and hydrochloric acids. (2) Urotropon, combined with other inhibitors, becomes more effective. (3) In phosphoric acid solution, KI-1 additive is more effective than PB-5 additive to steel corrosion.

Author(s): Mink,W.H. Firbert,R.B. Jr.
Title: Design and development of a refrigeration cycle employing the principle of azeotropic mixtures.
Source: Final report prepared for American Gas Association. Columbus, Ohio: Battelle Memorial Institute. Jily 29, 1955.
Paper No.: A129 Language: English
Reviewer: Japan-H Doc.type:

Author(s): Mollier,H.
Title: Dampfdruck von wässrigen Ammoniaklösungen.
Title Eng: Vapor pressure of water and ammonia solutions.
Source: VDI Zeitschrift, vol.52, p1315-20, August 15, 1908.
Paper No.: B131 Language: German
Reviewer: Japan-J Doc.type: Journal
Comment: Has historical significance alone.

Data No.: B131-01
Fluids: AM, WA
Category: PVT-X
Pressure: 100~1000kPa
Temp.: 20~180℃
Conc.: 0~50%(ammonia)

Author(s): Mollier,H.
Title: Lösungswärme von Ammoniak in Wasser.
Title Eng: Heat of solution of ammonia in water.
Source: Mitt. uber Forschungsarbeiten, No.63-64, p107-13, 1909.
Paper No.: B130 Language: German
Reviewer: Japan-J Doc.type: Journal
Comment: Since the data contained are old, they will probably be included in the subsequent papers.

Data No.: B130-01
Fluids: AM, WA
Category: Enthalpy
Temp.: 13℃
Conc.: 0~79wt%(ammonia)

Author(s): Morel,J.Y
Title: CONTRIBUTION TO THE STUDY OF THERMODYNAMIC PROPERTIES OF PRESSURIZED NON-IDEAL SYSTEMS USED IN ABSORPTION HEAT PUMPS.
Source: Rueil-Malmaison, France; Institut Francais du Petrole (IFP). 1983. 161p. Availability: Institut Francais du Petrole (IFP), 92 Rueil-Malmaison. Theses(D.Ing.).
Paper No.: D118 Language: French
Reviewer: Belgium Doc.type: Book

Author(s): Moser,F.
Title: Development work on AHP-working mixtures for industrial applications at TU Graz.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C267 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings
Comment: Absorption heat pump cycles with various working fluids are simulated and compared with that with ammonia-water system.

Items to be analyzed in type I heat transformers include physical properties, COP, cost of operation and so on. A look at the results of calculation shows that, although the physical properties of the working fluids are oriented in relation to the AHP system, this is still on the theoretical level. Thus, the results are not necessarily acceptable. It may be concluded that a systemized approach to giving a detailed account of representative fluids by means of numerical formulas will be effective.

Author(s): Mucic,V.
Title: Resorption compression heat pump.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C268 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings
Comment: A multi-component resorption heat pump has a higher COP than a single component compression heat pump. The working process of the compression heat pump is shown by Carnot cycle, while that of the resorption heat pump is shown by Joule cycle. The results of COP ($\varepsilon 1, \varepsilon 2$) caluculation for both are shown in the chart. In order to testify them, an ammonia-water resorption heat pump (about 500kW) was developed and tested. From the results it is found that, while it is ideal for a fluid for ordinary absorption heat pumps to have large heat of absorption, it is better for a fluid for resorption heat pumps to generate large heat.

Author(s): Muehlmann,H.P. Wessing,W.
Title: Thermodynamische Prozessdaten einer Gas - Absorptionswärmepumpe.
Title Eng: Thermodynamic process data of a gas-powered absorption heat pump.
Source: Gas Wärme Int., 1984, vol.33, no.11, P.565-9.
Paper No.: D122 Language: German
Reviewer: Germany Doc.type: Journal
Comment: Calculation of the stationary process of a gas-powered absorption heat pump.

Data No.: D122-01
Fluids: AM, WA
Category: Heat_pump, COP

Author(s): Munson,E.S.
Title: Fluoroxine toxicity inducted by phenobarbital.
Source: Chem. Abstr., Vol.84, 1976, 69435 x .
Paper No.: C134 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: It is indirectly stated that TFE has toxicity.

Data No.: C134-01
Fluids: TFE
Category: Toxicity

Author(s): Murphy,K.P. Simen,R. Phillips,B. Marsala,J. Whitlow,E.

Title: Development of a residential gas fired absorption heat pump,physical and thermodynamic properties of R123a/ETFE,system development and testing,economic analysis.
Source: final report ORNL/Sub/79-24610/5 by Allied Corportation, Morristown, N.J. November 1983.(ORNL/sub/79-24610/4, 1979)
Paper No.: A136 Language: English
Reviewer: Japan-G Doc.type: Report
Comment: In relation to its subject heat pump, this paper surveys R123a/ETFE as an organic working fluid, with special interest in its physical properties, safety and toxicity, reporting that the results are satisfactory for both safety and toxicity. Excellent results were also obtained for the heat pump as a whole - with the COP of 1.5 in the cooling mode and 0.65 in the heating mode.

Data No.: A136-01
Fluids: R123a, ETFE
Category: PVT-X, Enthalpy
Corrosiveness
Pressure: 12kPa～0.21MPa
Temp.: evaporator: 0.17～22.2℃, absorber: 56℃

Author(s): Murphy,K.P. Phillips,B.A.
Title: Development of a residential gas absorption heat pump.
Source: ASHRAE-Transactions, vol.89, 1983, pt.1.
Paper No.: C137 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Proposed an R123a-ETFE heat pump system, estimating that the heating COP of up to 1.5 will be achievable.

Data No.: C137-01
Fluids: R123a, ETFE
Category: PVT-X, Heat_pump
COP

Author(s): Nakanishi,M. Iyoki,S. Uemura,T.
Title: H2O-LiBr-ZnBr2系吸収冷凍機について (第一報)
Title Eng: Studies on H2O-LiBr-ZnBr2 absorption refrigerators.
Source: 日本冷凍協会学術講演会講演論文集; Proc. JAR Annual Conf., 1983, P21-24.
Paper No.: B202 Language: Japanese
Reviewer: Japan-E Doc.type: Conference proceedings
Comment: Aimed to extend the operating temperature range and to develop air-cooled absorption refrigerating machines, this paper examines a ternary system made by adding ZnBr2 to the H2O-LiBr system, with a view to improving the thermodynamic and transport properties of the H2O-LiBr which is the mainstream refrigerant-absorbent in Japan. Taking account of the solubility measurement, it is concluded that, side by side with H2O-LiBr-ZnCl2, this system has a wide operating range. The optimum mixing ratio of LiBr and ZnBr2 is also determined. These data will be very useful when attempting air-cooled systemization and improving performance.

Data No.: B202-01
Fluids: WA, LB, ZB
Category: PVT-X, Specific_heat
Viscosity

Author(s): Niesemeyer,N.
Title: Zur Auswahl von Arbeitsstoffpaarungen von Absorptionwärmepumpen.
Title Eng: Selection of working fluids for absorption heat pumps.
Source: Dissertation (Dr.-Ing.), NP-7770052, May 1985, 127p.
Corp_src: Technische Univ. Braunschweig (Germany, F.R.). Fakultät für Maschinenbau und Elektrotechnik.
Paper No.: D126 Language: German
Reviewer: Germany Doc.type: Dissertation
Comment: Thermophysical properties of various working fluids are calculated using the PHC (perturbated hard chain) theory. Thereby the three parameters of the pure components and the four mixing parameters are determined from experimental data.

Data No.: D126-01
Fluids: AM, WA
Category: Others

Author(s): Ogawa,K.
Title: 臭化リチウム水溶液の熱力学的性質　第一報：大気圧における定圧比熱の測定
Title Eng: Thermodynamic properties of aqueous solution of lithium bromide -1st report; measurement of specific heat at atmospheric pressure.
Source: 冷凍; Refrigeration, Vol.55, No.630, p65-68, April 1980.
Paper No.: B139 Language: Japanese
Reviewer: Japan-J Doc.type: Journal
Comment: By measuring the specific heat under the atmospheric pressure, an experimental equation was formulated.

Data No.: B139-01
Fluids: WA, LB
Category: Specific_heat
Pressure: atomospheric pressure
Temp.: 20～100℃
Conc.: 10～60wt%(LiBr)

Author(s): Ono,Y.
Title: Thermodynamic and physical properties of various H2O-LiBr multi-absorbent systems.
Source: Tokyo Gas. Internal Reports. 1979.
Paper No.: B141 Language: English
Reviewer: Japan-H Doc.type:

Author(s): Oosako,H. Sawaya,T.
Title: ハロゲン化リチウム-脂肪族アルコール系の物理化学的研究（第1jLiCl-CH3OH系，LiBr-CH3OH系及びLiBr-nC3H7OH系の溶解性
Title Eng: Physiochemical studies on the systems LiCl-CH3OH, LiBr-CH3OH, LiBr-nC3H7OH.
Source: 日本化学雑誌; J. Chem. Soc. Japan, Pure Chem. Sect., vol.71, 1950, No.2, p159.
Paper No.: B142 Language: Japanese
Reviewer: Japan-J Doc.type: Journal

Data No.: B142-01
Fluids: MAl, LC
Category: Solubility, Crystallization
Temp.: 0～30℃

Data No.: B142-02
Fluids: MAl, LB
Category: Solubility, Crystallization
Temp.: 0～40℃

Data No.: B142-03
Fluids: PAl, LB
Category: Solubility, Crystallization
Temp.: 0～40℃

Author(s): Oouchi,T.
Title: Thermodynamic and physical properties for R22-E181,R123a-E181,and R123a-ETFE systems.
Source: Hitachi, Internal Reports. 1985.
Paper No.: B143 Language: Japanese
Reviewer: Japan-D Doc.type: Others
Comment: Offers data adapted from Lateshev's data, Loeffler's and Mastrangelo's data (enthalpy diagram, Duhring diagram).

Data No.: B143-01
Fluids: R22, DMETEG
Category: Enthalpy
Pressure: 50k～2MPa
Temp.: 0～200℃
Conc.: 0～100%

Data No.: B143-02
Fluids: R22, DMETEG
Category: PVT-X
Pressure: 0～2.0265MPa
Temp.: -20～200℃
Conc.: 0～90℃

Author(s): Oouchi,T.
Title: Thermodynamic data for LiBr-H2O solutions.
Source: Hitachi. Internal Reports. 1985.
Paper No.: B145 Language: Japanese
Reviewer: Japan-D Doc.type: Others
Comment: Offers data adapted from Hasaba and Uemura's data: (1) Duhring diagram. (2) Enthalpy diagram.

Data No.: B145-01
Fluids: WA, LB
Category: PVT-X
Pressure: 66.7Pa～133.3kPa
Temp.: -20～190℃
Conc.: 0～70℃

Data No.: B145-02
Fluids: WA, LB
Category: Enthalpy
Temp.: 0～200℃
Conc.: 0～700%

Author(s): Osaka Gas Company.
Title: Thermodynamic diagrams for H2O-LiBr-ZnCl2,LiBr-H2O solutions .
Source: Internal Reports. 1985.
Paper No.: B146 Language: Japanese
Reviewer: Japan-C Doc.type: Others(内部資料)
Comment: Formulas for estimating vapor pressure, viscosity, density and enthalpy of H2O-LiBr, H2O-LiBr/ZnCl2 are presented.

Author(s): Ouchi,Y. Ito,S. Akagi,I. Nagayasu,K.
Title: 吸収式冷暖房機の吸収剤の開発
Title Eng: Development of an absorbent for absorption cooling and heating machines.
Source: 日本冷凍協会学術講演会論文集; Proc. JAR Annual Conf., 1982, p13-16.
Paper No.: D248 Language: Japanese
Reviewer: Doc.type: Conference

Author(s): Parañjape,D.V. Chaudhari,S.K. Eisa,M.A.R. Holland,F.A.
Title: Characteristics of water-calcium chloride and water-lithium bromide absorption heat pumps.
Source: AIChE J., 1986, vol.32, no.11, P.1924-7.
Paper No.: D132 Language: English
Reviewer: Japan-A Doc.type: Journal
Comment: Experimentally evaluated the characteristics of an absorption heat pump using lithium bromide solution and calcium chloride solution. The main conclusions are as follows: (1) The absorption heat pump using calcium chloride solution can achieve 80~90% of theoretical COP (COP=1.2~1.4). (2) Adding lithium bromide is effective for preventing crystallization in the calcium chloride heat pump (LiBr:CaCl2=1:1).

Data No.: D132-01
Fluids: WA, CC, LB
Category:
Temp.: 70℃(condenser,absorber); 98~ 102℃(generator)
Conc.: CC:LB=1:1
Memo1: flow ratio:10~40

Data No.: D132-02
Fluids: LB
Category: Heat_pump, COP
Temp.: 70℃(condenser,absorber); 98~ 102℃(generator)
Memo1: flow ratio:10~40

Data No.: D132-03
Fluids: WA, CC
Category: Heat_pump, COP
Temp.: 70℃(condenser,absorber); 98~ 102℃(generator)
Conc.: CC:49.4~51.5wt%
Memo1: flow ratio:10~40

Author(s): Patterson,M.R. Perez-Blanco,H.
Title: Numerical fits of the properties of lithium-bromide water solutions.
Source: ASHRAE Trans., Vol.94, Pt.2, 1988.
Paper No.: D266 Language: English
Reviewer: Doc.type: Journal

Author(s): Pavlopoulos,T. Strehlow,H.
Title: Die Löslichkeiten der Alkalihalogenide in Methylalkohol, Acetonitril und Ameisensäure.
Title Eng: Solubility of alkalihalogenides in methyl alcohol, acetonitrile and formic acid.
Source: Zeitschrift f. phys. Chemie, Leipzig, Vol.202, 1954, p474-479.
Paper No.: C147 Language: German
Reviewer: Japan-J Doc.type: Journal
Comment: Useful for having a general review of solubility of various alkalihalogenides into methanol, acetonitrile and formic acid (18,25℃).

Author(s): Pennington,W.
Title: How to find accurate vapor pressures of LiBr water solutions.
Source: Refrig. Eng.,vol.63, p57-61, 1955 May.
Paper No.: A148 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Obtained a correlation equation of vapor pressure of lithium bromide solution.

Data No.: A148-01
Fluids: WA, LB
Category: PVT-X
Pressure: 2.03~10.46psi,0.14~0.72bar
Temp.: 175~290°F,79~143℃
Conc.: 50~60%LiBr

Author(s): Perez-Blanco,H. Patterson,M.R. Braunstein,J.
Title: Ideal Fluid Properties for Optimizing Absorption Heat Pump Performance.
Source: ORNL/TM-10315, April 1987, 48p; NTIS, PC A03/MF A01
Corp_src: Oak Ridge National Lab., TN. *Department of Energy, Washington, DC.
Paper No.: D134 Language: English
Reviewer: Japan-F Doc.type: Report
Comment: If an ideal fluid is found out, the ideal COP of single effect absorption heat pumps will reach 1.6~2.18.

Author(s): Perman,E.P.
Title: Vapor pressure of aqueous ammonia solution, part 1.
Source: J. Chem. Soc., vol.79, p718-25, 1901.
Paper No.: B149 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Did not make quantitative evaluation of experimental accuracy.

Data No.: B149-01

Fluids: AM, WA
Category: PVT-X
Pressure: 17.5~1800mmHg,0.023~2.40bar
Temp.: 0~61.3℃
Conc.: 0~35mol%(ammonia)

Author(s): Phillips,B.A.
Title: Development of absorption heat pumps using organic fluid pairs.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C269 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings
Comment: Among organic fluids, R21-ETFE and R133-ETFE are well known. The new fluids are suitable for air-cooled absorption air conditioning, or a heat pump operated at the evaporation temperature of below -20℃. It was also found that, if the machine is designed to fit the fluid's characteristics, its performance is essentially equivalent to that of ammonia-water system. Although, compared to the ammonia-water system, the new fluid was small in heat of vaporization, low in heat and mass transfer rate, and has a quality deteriorating effect upon the structural materials or reacts to them, these problems were solved by developing a new solution heat pump, inactivating the medium to aluminum, and performing various types of life test.

Author(s): Podoll,R.T. Gray,T.E. Rolon,C.E. Sabo,K.A.
Title: Determination of properties of fluids for solar cooling applications.
Source: Prepared for Department of Energy by SRI International. Menlo Park, California. 1982.(U.S.DOE Rep No SRI-RYU-2221(1981))
Paper No.: A153 Language: English
Reviewer: Japan-G Doc.type: Report
Comment: Gives a generalized account of physical properties of various refrigerants. By taking up ammonia, methylamine, ethylamine, R21 and R22 as refrigerants, reviews their combinations with various types of absorbent.

Data No.: A153-01
Fluids: AM, MA, Ethylamine, R22, R21
Category: Enthalpy, Specific_heat
Others

Author(s): Polak,J. Lu,B.C.Y.
Title: Vapor-liquid equilibria in system ammonia-water at 14.69 and 65 psia.
Source: J. Chem. Eng. Data, Vol.20, No.2, 1975.
Paper No.: A154 Language: English
Reviewer: Japan-J Doc.type: Journal

Data No.: A154-01
Fluids: AM, WA
Category: PVT-X
Pressure: 14.69, 65psia (1bar,4.42bar)

Author(s): Radermacher, R.
Title: Ternary working fluid for absorption heat pumps.
Source: Univesity of Maryland, Department of Mechanical Engineering.(EUR Rep Comm Eur Commun , p54-p70 (1985)
Paper No.: B158 Language: English
Reviewer: Japan-G Doc.type: Conference proceedings
Comment: Performed tests on the subject ternary fluids as used in an high-temperature absorption heat pump. 14 to 15 kW of heating capacity generated when the outdoor temperature was -8~8℃ and the hot water inlet temperature was 40℃. 0.97~1.08 of COP was obtained. It was only a little lower than that obtained in ammonia-water system. This is an attempt tp reduce a loss due to rectification by mixing LiBr into conventional binary system.

Data No.: B158-01
Fluids: AM, LB, WA
Category: PVT-X, Specific_heat
Viscosity, Heat_pump
Pressure: 0~30bar
Temp.: -20~ 200℃
Conc.: 0~ 100%(LiBr/H20=0.38/0.62, 0.48/0.52)

Data No.: B158-02
Fluids: MA, LB, WA
Category: PVT-X, Specific_heat
Viscosity, Heat_pump
Pressure: 0~30bar
Temp.: -20~ 200℃
Conc.: 0~ 100% (LiBr/H20=0.38/0.62, 0.48/0.52)

Data No.: B158-03
Fluids: AM, WA
Category: PVT-X, Specific_heat
Viscosity, Heat_pump
Pressure: 1~30bar
Temp.: -20℃~ 180℃
Conc.: 0~ 100%

Author(s): Radermacher,R. Alefeld,G.
Title: Lithiumbromid-Wasser-Lösungen als Absorber für Ammoniak oder Methylamin.
Title Eng: Lithium bromide - water solutions as absorbers for ammonia or methylamine.
Source: Brenst.-Wärme Kraft. Vol.34. 31-38. January 1982.
Paper No.: B160 Language: German
Reviewer: Japan-F Doc.type: Journal
Comment: When monomethylamine is used as refrigerant, pressure becomes lower than in the case of ammonia. Still, however, monomethylamine seems to hav› many problems in thermal stability and corrosiveness.

Data No.: B160-01
Fluids: AM, WA, LB
Category: Enthalpy, Heat_pump

Data No.: B160-02
Fluids: MA, WA, LB
Category: Enthalpy, Heat_pump

Author(s): Rafflenbeul,L. Hartmann,H.
Title: Eine dynamische Apparatu zur Bestimmung von Dampt-Flüssigkeits-Phasengleichgewichten.
Title Eng: A dynamic apparatus for measurements of vapor-liquid equilibria.
Source: Chemie-Technik, Vol.7, No.4, January 1978.
Paper No.: B161 Language: German
Reviewer: Japan-J Doc.type: Journal

Data No.: B161-01
Fluids: PPA, WA
Category: PVT-X
Temp.: 60～100℃

Author(s): Raldow,W.
Title: New working pairs for absorption processes.
Source: Proc. of a workshop in Berlin. April 14-18 1982. veroffentlicht von Swedish Council for Building Research.
Paper No.: C162 Language: English
Reviewer: Japan=B Doc.type: -

Author(s): Renz,M.
Title: Eignung von Arbeitsstoffpaaren für Absor ptionswärmepumpenprozesse.
Title Eng: Suitability of Solvent/Refrigerant Agents in Absorption Heat Pumps.
Source: Kongreßband der Wärmepumpen-Tagung in Essen, Vulkan-Verlag Essen 1977 S72-78
Paper No.: C163 Language: German
Reviewer: Japan-D Doc.type: Conference proceedings
Comment: Explains about, and evaluates aptitude of, heat pump working fluids, such as ammonia-water, ammonia-lithium nitrate and methylamine-water systems. One of the important criteria is whether or not a rectifier is needed. An isobaric curve for each system at -10℃ (0℃ in the case of water) of refrigerant evaporation temperature is prepared, and can also be used for evaluation.

Data No.: C163-01
Fluids: AM, WA
Category: PVT-X
Pressure: ～2MPa
Temp.: -30～250℃
Conc.: 0～100%

Data No.: C163-02
Fluids: AM, LNT
Category: PVT-X
Temp.: -20～180℃
Conc.: 0～30%

Data No.: C163-03
Fluids: MA, WA
Category: PVT-X

Temp.:   -30～200℃

Data No.: C163-04
Fluids: R22, DMETEG
Category: PVT-X
Temp.:   -30～200℃

Data No.: C163-05
Fluids: WA, LB
Category: PVT-X

Data No.: C163-06
Fluids: MA, LB
Category: PVT-X

Author(s): Renz,M.
Title: Eignung von Arbeitsstoffpaaren für Absor ptionswärmepumpenprozesse.
Title Eng: Suitability of solvent/refrigerant agents in absorption heat pumps.
Source: Heat pumps. Wärmepumpen. : Vulkan-Verlag, 1980. pp.72-78; Conference on heat pumps, Essen, F.R. Germany, Sept.1977,ISBN: 3-8027-2340-6.
Paper No.: D147   Language: German
Reviewer: Germany Doc.type: Book Article; Conference
Comment: Only log p - 1/T diagram.

Data No.: D147-01
Fluids: AM, WA
Category: PVT-X
Pressure: 0.5 - 50 bar
Temp.:   -30 - 260 ℃
Conc.:   0.0 - 1.0

Data No.: D147-02
Fluids: AM, LN
Category: PVT-X
Pressure: 1.5 - 50 bar
Temp.:   -30 - 180 ℃
Conc.:   0.3 - 1.0

Data No.: D147-03
Fluids: MA, WA
Category: PVT-X
Pressure: 0.5 - 40 bar
Temp.:   -30 - 200 ℃
Conc.:   0.05 - 1.0

Data No.: D147-04
Fluids: WA, LB
Category: PVT-X
Pressure: 0.005 - 1 bar
Temp.:   -30 - 180 ℃
Conc.:   0.3 - 1.0

Data No.: D147-05
Fluids: R22, DMETEG
Category: PVT-X
Pressure: 0.5 - 40 bar

Temp.:   -30 - 200 ℃
Conc.:   0.05 - 1.0

Data No.: D147-06
Fluids: MA1, LB
Category: PVT-X
Pressure: 0.01 - 2 bar
Temp.:   -30 - 140 ℃
Conc.:   0.45 - 1.0

Author(s): Renz,M.
Title: Thermodynamishe Eigenshaften des ternären Stoffsystems Methanol-Lithiumbromid-Zinkbromid.
Title Eng: Thermodynamic characteristics of the ternary fluid system methanol - lithiumbromide - zincbromide.
Source: Ki Klima - Kälte, Heizung, Vol.9, 1981, P411-414.
Paper No.: D192   Language: German
Reviewer: Japan-C Doc.type: Journal
Comment: (1) CH3OH-ZnBr2 is not advantageous over water-LiBr for PTX. (2) CH3OH-LiBr-ZnBr2 a) Solubility and vapor pressure drop become largest when the molar ratio is LiBr/ZnBr2 = 1/1 b) Measured solubility, PTX, density and viscosity of CH3OH-LiBr/ZnBr2 (molar ratio 1:1). c) compared the isobaric solubility curve and kinematic viscosity with those of water-LiBr and other solutions.

Data No.: D192-01
Fluids: MA1, ZB
Category: PVT-X
Pressure: ~1000mbar
Temp.:   -20~ 110℃
Conc.:   20~ 100%(Methanol)

Data No.: D192-02
Fluids: MA1, LB, ZB
Category: PVT-X, Solubility
          Viscosity, Others
Pressure: ~1000mbar(PTX)
Temp.:   -20~ 120℃(PTX), 5~ 140℃(solubility), 20~ 100℃(density),20~90℃(viscosity)
Conc.:   Methanol:20~ 100%(PTX), 20~ 100%(density), 20~50%(viscosity)

Author(s): Roberson,J.P. Lee,C.Y. Squires,R.G.
           Albright,L.F.
Title: Vapor pressure of ammonia and methylamines in solutions for absorption refrigeration systems.
Source: ASHRAE Trans, Vol.72, Part.1, p198-208, 1966.
Paper No.: A167   Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: (1) By measuring the vapor pressure of organic absorbent-ammonia system, organic absorbent-methylamine system, salt-ammonia system, and organic absorbent-salt-ammonia system, the paper examines working fluids suitable for absorption refrigerating machines. (2) 25~100℃.

Data No.: A167-01

Fluids: AM, TEG
Category: Solubility
Temp.: 25～100℃

Data No.: A167-02
Fluids: AM, 1,4 BDL
Category: Solubility
Temp.: 25～100℃

Data No.: A167-03
Fluids: AM, 2,3 BDL
Category: Solubility
Temp.: 25～100℃

Data No.: A167-04
Fluids: AM, NB
Category: Solubility
Temp.: 25～100℃

Data No.: A167-05
Fluids: AM, OCA
Category: Solubility
Temp.: 25～100℃

Data No.: A167-06
Fluids: AM, AN
Category: Solubility
Temp.: 25～100℃

Data No.: A167-07
Fluids: AM, DMA
Category: Solubility
Temp.: 25～100℃

Data No.: A167-08
Fluids: AM, DMETEG
Category: Solubility
Temp.: 25～100℃

Data No.: A167-09
Fluids: AM, DMETrEG
Category: Solubility
Temp.: 25～100℃

Data No.: A167-10
Fluids: AM, HX
Category: Solubility
Temp.: 25～100℃

Data No.: A167-11
Fluids: AM, PDS
Category: Solubility
Temp.: 25～100℃

Data No.: A167-12
Fluids: MA, 1,4 BDL
Category: Solubility
Temp.: 25～100℃

Data No.: A167-13

Fluids: MA, EG
Category: Solubility
Temp.: 25～100℃

Data No.: A167-14
Fluids: MA, EEDEG
Category: Solubility
Temp.: 25～100℃

Data No.: A167-15
Fluids: MA, DMETEG
Category: Solubility
Temp.: 25～100℃

Data No.: A167-16
Fluids: MA, TEG
Category: Solubility
Temp.: 25～100℃

Data No.: A167-17
Fluids: DMAm, 1,4 BDL
Category: Solubility
Temp.: 25～100℃

Data No.: A167-18
Fluids: TMA, 1,4 BDL
Category: Solubility
Temp.: 25～100℃

Data No.: A167-19
Fluids: AM, ST
Category: Solubility
Temp.: 25～100℃

Data No.: A167-20
Fluids: AM, SB
Category: Solubility
Temp.: 25～100℃

Data No.: A167-21
Fluids: AM, SI
Category: Solubility
Temp.: 25～100℃

Data No.: A167-22
Fluids: AM, SI, ST
Category: Solubility
Temp.: 25～100℃
Conc.: NaI:NaCNS=2:1,1:2(by weight)

Data No.: A167-23
Fluids: AM, AB
Category: Solubility
Temp.: 25～100℃

Data No.: A167-24
Fluids: AM, AI
Category: Solubility
Temp.: 25～100℃

Data No.: A167-25
Fluids: AM, 1,4 BDL, ST
Category: Solubility
Temp.: 25～100℃

Data No.: A167-26
Fluids: AM, 1,4 BDL, SI
Category: Solubility
Temp.: 25～100℃

Data No.: A167-27
Fluids: 1,4 BDL, AI
Category: Solubility
Temp.: 25～100℃

Data No.: A167-28
Fluids: AM, 1,4 BDL, SI, ST
Category: Solubility
Temp.: 25～100℃

Data No.: A167-29
Fluids: AM, TEG, ST
Category: Solubility
Temp.: 25～100℃

Author(s): Rochester,C.H. Symonds,J.R.
Title: Thermodynamic studies of fluoroalcohols.
Source: J. Chem. Soc. Faraday Trans., Vol.1, No.69, 1973. 7, p1267-81 and 69 (1973) 9, p1577-85.
Paper No.: C168 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: By measuring heat of vaporization of 5 types of fluoroalcohol, heat of solution into water (infinite dilution) and free energy of hydration, hydration enthalpy and hydration entropy are obtained.

Data No.: C168-01
Fluids: TFE, WA
Category: Enthalpy
Temp.: 314～328K(heat of vaporization); 288～318K(heat of solution)

Data No.: C168-02
Fluids: TFP, WA
Category: Enthalpy
Temp.: 323～334K(heat of vaporization); 228～318K(heat of solution)

Data No.: C168-03
Fluids: PFP, WA
Category: Enthalpy
Temp.: 228～318K(heat of solution)

Data No.: C168-04
Fluids: TrFP, WA
Category: Enthalpy
Temp.: 320～333K(heat of vaporization); 228～318K(heat of solution)

Data No.: C168-05
Fluids: HFP, WA
Category: Enthalpy
Temp.: 318～331K(heat of vaporizatio); 228～318K(heat of solution)

Author(s): Rockenfeller,U
Title: New industrial chemical heat pump working fluids, Final report.
Source: ORNL/Sub-85-22014/1, 1986.
Paper No.: D184 Language:
Reviewer: Japan-A Doc.type: Report
Comment: By screening about 70 refrigerant-absorbent combinations on condition that a combination can be used within 80 to 250°C of temperature range, TFE/E181 was selected as a promising system. As an inorganic system, NaOH-KOH combination is selected and PTX chart of its solution is prepared. As an organic system, TFE/DBP is named as being selectable, in addition to TFE/E181.

Data No.: D184-01
Fluids: WA, SH, PH
Category: PVT-X
Pressure: 6～12bar
Temp.: 200～ 250°C
Conc.: 58.2～58.6 mass%(solute)

Data No.: D184-02
Fluids: TFE, DBP
Category: PVT-X
Pressure: 5～10bar
Temp.: 190～ 220°C
Conc.: 0.201(fraction of TFE)

Data No.: D184-03
Fluids: TFE, DMETEG
Category: PVT-X, Enthalpy
Specific_heat, Viscosity
Pressure: 1～20bar (PTX)
Temp.: 80～ 250°C (PTX)
Conc.: 0～ 100% (PTX)

Author(s): Rojek,A.
Title: Absorption heat pumps and heat transformers fluid pairs for novel cycles. Reseach work undertaken at IFP.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C270 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings

Author(s): Rolland,Mlle
Title: Reserch on new pairs for domestic absorption heat pumps.
Source: EUR-10007-EN; Comm. Eur. Communities, (Rep.) EUR (1985); Absorpt. Heat Pumps Congr., P.33-44
Corp_src: Comm. Eur. Communities
Paper No.: D149 Language: English
Reviewer: Japan-F Doc.type: Report; Conference

Author(s): Ryan,J.D.
Title: FLUID PAIRS FOR ADVANCED ABSORPTION CYCLES: SELECTION METHODS AND DATA REQUIREMENTS.
Source: Proceedings, Intersociety Energy Conversion Engineering Conf.(Aug.1983) v.4 p.1915-1920; CODEN:PIECDE; ISSN: 0146-955X.
Paper No.: D150 Language: English
Reviewer: Japan-J Doc.type: Journal; Conference
Comment: Describes evaluation criteria and methods upon selecting working fluids for advanced absorption heat pumps.

Author(s): Sallee,M.
Title: A study of absorption heat pumps by Gaz de France and Armines.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C271 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings
Comment: (1) Deals with a gas-fired heat pump suitable for residential application. (2) Specified heat pump: evaporator = 10℃, hot water = 40~45℃, condenser = 65℃, boiling temperature = 100~120℃. (3) Thermodynamically required physical property values: combinations of 4 types of refrigerant and 13 types of absorbent were finally selected after surveying many pieces of literature. (4) It is expected that, since physical property values can be calculated, thermal stability and corrosion can be confirmed, and data can be collected by designing and constructing a pilot plant, it will become possible to select a working fluid, and correctly design and control equipment by means of a computer.

Author(s): Scatchard,G. Epstein,L.F. Warburton,J. Jr,. Cody,P.J.
Title: Thermodynamic properties -saturated liquid and vapor of ammonia-water mixtures.
Source: J.ASRE, 1947 May.
Paper No.: A171 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Tabulated conventional measurement data. Data used are as follows: Zinner et al. (literature B245), Wucherer(literature B234), Perman (literature B149).

Data No.: A171-01
Fluids: AM, WA
Category: PVT-X, Enthalpy
Temp.: -51~188℃

Author(s): Schlerkmann,H. Schwenk,W.
Title: Untersuchung von Säureinhibitoren hinsichtlich ihrer Wirkunk gegenüber H-induzierter Korrosion.
Title Eng: Investigation of inhibitors regarding weight loss corrosion and hydrogen absorption in acids.
Source: Werkstoffe & Korrosion (Germany), vol.35, no.10, P.449-54, Oct. 1984.

Paper No.: D151   Language: German
Reviewer: Germany Doc.type: Journal
Comment: No direct relation to absorption working fluids. Name of the inhibitors is not mentioned in the paper.

Author(s): Schulz,S.C.G.
Title: Equations of state for the system ammonia-water for the use with computers.
Source: Reprint from the Proceedings of the 7th International Congress of Refrigeration. Washington D.C. Vol.2. 1971.
Paper No.: B177   Language: English
Reviewer: Japan-D Doc.type: Conference proceedings
Comment: Since Gibbs free energy is the basis for gas-liquid equilibrium, thermodynamic properties were calculated from that, and temperature and pressure.

Data No.: B177-01
Fluids: AM, WA
Category: PVT-X, Enthalpy
Pressure: 1MPa(critical point)
Temp.:   100K

Author(s): Seher,D. Stephan,K.
Title: Trifluorethanol als Arbeitsstoff für Absorptionswärmepumpen und Absorptionswärmetransformatoren.
Title Eng: Trifluoroethanol as working substance in absorption heat pumps and heat transformers.
Source: Ki Klima-Kälte-Heizung, p295-301, July-August 1983.
Paper No.: B180   Language: German
Reviewer: Japan-J Doc.type: Journal
Comment: TFE-DMETEG is recommended as an absorption heat pump working fluid. A vapor pressure chart was prepared form the experiment with gas-liquid equilibrium, and heat pump characteristics were calculated.

Data No.: B180-01
Fluids: TFE, DMETEG
Category: PVT-X, Heat_pump
Pressure: PVT:725Torr(0.967bar)
Temp.:   PVT:73~ 192℃

Author(s): Seher,D. Stephan,K.
Title: Sorptionswärmepumpe "Stoffsysteme".
Title Eng: Sorption heat pump system "working substances".
Source: BMFT-FB-T-85-045, May 1985, 108p.
Corp_src: Bundesministerium für Forschung und Technologie, Bonn-Bad Godesberg (Germany, F.R.).
Paper No.: D157   Language: German
Reviewer: Germany Doc.type: Report
Comment: Experimental and calculated data. Calculation of absorption heat pump and heat transformer process. Comparison of the results with ammonia-water and water-LiBr.

Data No.: D157-01
Fluids: TFE, DMETEG
Category: PVT-X, Viscosity
          Stability, Heat_pump

Pressure: P: 0.967, 0.2 bar; density: 1 bar
Temp.: P: 0 - 200 ℃; density: 20 - 70 ℃
Conc.: P: 0 - 1; density: 0 - 1 (mass fraction)

Data No.: D157-02
Fluids: TFE, DMP
Category: Viscosity, Stability
PVT-X
Pressure: 1 bar
Temp.: 20 - 70 ℃
Conc.: 0 - 1 (mass fraction)

Data No.: D157-03
Fluids: TFE, DBP
Category: Viscosity, Stability
PVT-X
Pressure: 1 bar
Temp.: 20 - 70 ℃
Conc.: 0 - 1 (mass fraction)

Author(s): Seher,Dieter Stephan,Karl
Title: Trifluoroethanol as working substance in absorption heat pumps.
Source: EUR-10007-EN; Comm. Eur. Communities, (Rep.) EUR (1985); Absorpt. Heat Pumps Congr., P.23-32.
Corp_src: Comm. Eur. Communities
Paper No.: D158 Language: English
Reviewer: Japan-A Doc.type: Report; Conference
Comment: After discussing pairs for conventional ammonia-water system heat pumps from the point of view of various physical properties, they were evaluated with a single stage absorption heat pump. (1) Systems: NH3-H2O, R22-E181, methanol-LiBr, trifluoroethanol(TFE)-E181; the COP is evaluated. (2) TFE-E181 showed excellent physical properties as a working fluid. a) The highest COP: 1.5 b) Transportation power requirements can be reduced conspicuously.

Data No.: D158-02
Fluids: R22, DMETEG
Category: Heat_pump, COP
Temp.: 110~ 180℃(generator)

Data No.: D158-03
Fluids: MAl, LB
Category: Heat_pump, COP
Temp.: 110~ 124℃(generator)

Data No.: D158-04
Fluids: TFE, DMETEG
Category: Heat_pump, COP
Temp.: 110~ 180℃(generator)

Data No.: D159-01
Fluids: AM, WA
Category: Heat_pump, COP
Temp.: 110~ 180℃(generator)

Author(s): Seliverstov,V.M.
Title: Solubility of difluoromonochloromethane in certain phthalates,dioctyl sebacate,triacetin and dimethylformamide.
Source: J.Appl.Chem. Vol.43. No.7. July 1970.
Paper No.: B181 Language: English
Reviewer: Doc.type:

Author(s): Sellerio,U.
Title: Absorptions-Kältemaschine mit Isobutylazetat-R22.
Title Eng: Absorption refrigerating machine operating with isobutylacetate-R22.
Source: Kältetechnik-Klimatisierung, Vol.18, Jahrgag, Heft 1, 1966.
Paper No.: B183 Language: German
Reviewer: Japan-J Doc.type: Journal
Comment: Shows a vapor pressure chart of isobuthyl acetate-R22 system.

Data No.: B183-01
Fluids: R22, IBA
Category: PVT-X, Refrigerating_machine

Author(s): Shein,A.B. Skryabina,N.E. Khaldeev,G.V.
Title: Effectiveness of inhibitors in corrosion and hydrogen absorption of deformed iron.
Source: Sov. Mater. Sci. (USA), Vol.20, No.2, P.94-6 Trans.P.183-5, March-April 1984.
Paper No.: D159 Language: English
Reviewer: Japan-C Doc.type: Journal
Comment: (1) Literature surveying hydrogen absorption in metal, and inhibitor effect upon the subsequent plastic deformation strength. (2) No directly related to the absorption system.

Author(s): Silberstein,S.
Title: Trifluoroethanol.
Source: Energy Research Abstracts, Vol.5, 1978 8, 12656.
Paper No.: C184 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Describes toxicity of TFE.

Data No.: C184-01
Fluids: TFE
Category: Toxicity

Author(s): Smith,S.E. Carey,C.O.B. Smith,G.F.
Title: Absorption heat pump research.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C272 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings
Comment: A required thermodynamic characteristics of working fluid is large latent heat. This realizes a reduced size of a solution heat exchanger which is a machine size determinant. The results are shown in Fig.1 for methanol/ bromide system. From the specific heat, it was found that water is best as refrigerant, and an azeotropic mixture with water was derived. It is capable of preventing

freezing. According to Wrewsky's law, azeotropic mixture changes with pressure, and this behavior is shown in Fig.2. Other types of absorbent named are sulfuric acid and sodium hydroxide.

Author(s): Steimle,F. Renz,M.
Title: Stoffsysteme für Absorptionswärmepumpen.
Title Eng: Combinations of working media for absorption heat pumps.
Source: VDI-Bericht, Nr.427, 1981, pp.37-44. Conference: VDI-Meeting: Absorption heat pumps - theory and practice, Aachen, Germany,F.R., 1-2 Oct 19
Paper No.: D165 Language: German
Reviewer: Germany Doc.type: Conference; Report
Comment: Definition of significant characteristic numbers to assess the suitability of working fluids of absorption heat pumps. Comparison of the following working fluids using these characteristic numbers. (1)WA/LB (2)Am/WA (3)R22/DMETEG (4)MAl/LB (5)MAl/LB/ZB.

Author(s): Steimle,F. Renz,M.
Title: Stoffsysteme für Absorptionswärmepumpen.
Title Eng: Systems of substances for absorption heat pumps.
Source: VDI-Berichte, Vol.427, p37-44, 1981.
Paper No.: B186 Language: German
Reviewer: Japan-J Doc.type: Journal
Comment: Compares water-lithium bromide, ammonia-water, R22-DMETEG and methanol-salt in heat pump performance.

Data No.: B186-01
Fluids: WA, LB
Category: Heat_pump

Data No.: B186-02
Fluids: AM, WA
Category: Heat_pump

Data No.: B186-03
Fluids: R22, DMETEG
Category: Heat_pump

Data No.: B186-04
Fluids: MAl, LB
Category: Heat_pump

Data No.: B186-05
Fluids: MAl, LB, ZB
Category: Heat_pump

Author(s): Steimle,F.
Title: Investigation of working fluids for absorption heat plants.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C273 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings
Comment: (1) So far, research has been carried out mainly on methanol + salt systems. As a result, it was found that ternary system methanol - LiBr-ZnBr2 (LiBr:ZnBr2=1:1 in

molar ratio) is most promising and wide in operating range. Thermal stability is low in the generator's temperature range. (2) Research continues on alcohol solution. (3) Research on methylamine with salt, organic solvents, aqueous salt solutions as absorbents continues. (4) Research on fluorinated alcohols, such as TFE, is also undertaken.

Author(s): Stephan,K.
Title: Investigations of absorption heat pumps and working fluids.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C274 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings

Author(s): Stierlin,H.
Title: Große Reduktion des Energieverbrauches bei den lautlosen Kühlschränken-Eine neue Generation von A bsorptions-Kühlschränken.
Title Eng: A great reduction of energy consumption with the noiseless refrigerators.
Source: Ki, Klima, Kälte, Heizung, Vol.8, 1980 9.
Paper No.: C188 Language: German
Reviewer: Japan-J Doc.type: Journal

Data No.: C188-01
Fluids: AM, WA
Category: Refrigerating_machine, COP

Author(s): Stueven,Uwe Schmidt,Adolf
Title: Working-fluid pair for absorption heat transforming devices.
Source: Patent no.3543171, June 1987 (Germany, F.R.)
Corp_src: Hoechst A.-G.
Paper No.: D168 Language: German
Reviewer: Germany Doc.type: Patent

Author(s): Subramanyam,N.C. Mayanna,S.M.
Title: Azoles as corrosion inhibitors for mild steel in alkaline mine water.
Source: Corros. Sci. (GB), 1985, vol.25, no.3, P.163-9.
Paper No.: D169 Language: English
Reviewer: Japan-F Doc.type: Journal
Comment: This literature is concerned not with working fluids, but with corrosion inhibitors for mild steel in mineral water. As such, it may be utilized as data on corrosion inhibitors for mild steel in impure refrigerants.

Data No.: D169-01
Fluids: WA, BImi, BTr, Imi
Category: Corrosiveness
Temp.: 20～50℃
Conc.: 0.001M (concentration of inhibitor)

Author(s): Sullivan,J.L. Smith,F.A. Wilkenfeld,R.M.
Garaen,R.H. Kostyniak,P.J.
Title: Monofluoroacetate and trifluoroethanol as testicular poisons in the rat.
Source: Toxicology and Applied Pharmacology, Vol.45, 1973, S. 291-292.
Paper No.: C189 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Describes the fact that, when rats are caused to drink or suck in water containing TFE, they are damaged in the testicles.

Data No.: C189-01
Fluids: TFE
Category: Toxicity

Author(s): Suzuki,S. Sato,S.
Title: Fundamental studies on the absorption refrigerating machine: part 3,physical properties of the binary system, R22-tetraethylene_glycol dimethyl ether (E181).
Source: 名城天学理工学部研究報告 No.14. pp65, 1973.
Paper No.: B190 Language: Japanese
Reviewer: Japan-D Doc.type: Report
Comment: Summarizes the results of measurement of index of refraction, density, vapor pressure and viscosity of R22-E181 system.
Data No.: B190-01
Fluids: R22, DMETEG
Category: PVT-X, Viscosity
Others
Temp.: Refractive index: 25～60℃; density:20～90℃; vapor pressure: 20～90℃; viscosity:20～90℃
Conc.: 0～23.6%

Author(s): Tange,Y. Uemura,T.
Title: R152－ジメチルホルムアミド系の物性
Title Eng: The physical properties of R152-DMF systems.
Source: 日本冷凍協会学術講演会講演論文集；Proc. JAR Annual Conf., Nov. 1973, P5-8
Paper No.: B197 Language: Japanese
Reviewer: Japan-E Doc.type: Conference proceedings
Comment: R152 seems to be physically and thermally favorable as refrigerant. This paper describes the results of measurement of index of refraction, specific gravity, viscosity, vapor pressure, specific heat and heat of dilution in the low concentration range. Additionally, it is estimated that R152-DMF can proveide performance similar to that of R21-DMF system.

Data No.: B197-01
Fluids: R152, DMF
Category: PVT-X, Specific_heat
Viscosity
Temp.: 10～60℃
Conc.: 0～15 wt%

Author(s): Tange,Y. Uemura,T.
Title: R152-ジメチルホルムアミド系吸収冷凍機について
Title Eng: The thermal and physical properties of R 152-dimethylformamide system.
Source: 冷凍; Refrigeration, Vol.49, No.562, p694, 1974.
Paper No.: B191 Language: Japanese
Reviewer: Japan-J Doc.type: Journal
Comment: Density, vapor pressure, specific heat, viscosity and differential heat of dilution of R152-DMF system were measured. However, the results are not enough, as measurement is limited to a low concentration range (below 20wt%).

Data No.: B191-01
Fluids: R152, DMF
Category: PVT-X, Enthalpy
Specific_heat, Viscosity
Conc.: 0~20wt%(DMF)

Author(s): Thieme,A. Albright,L.F.
Title: Solubility of refrigerants 11,21,and 22 in organic solvents containing a nitrogen atom and in mixtures of fluids.
Source: ASHRAE J., Vol.3, p71-75, 1961 July.
Paper No.: A192 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: (1) Carried out research on solubility of R11,R21 and R22 into organic solvent containing nitrogen atoms, in terms of deviation from Raoult's law. Among the binary systems, DMF and DEF proved excellent. As for the ternary systems, solubility cannot be said to have increased, compared to the binary systems. (2) Data are qualitative in nature.

Data No.: A192-01
Fluids: R11, DMF
Category: Solubility

Data No.: A192-02
Fluids: R21, DMF
Category: Solubility

Data No.: A192-03
Fluids: R22, DMF
Category: Solubility

Data No.: A192-04
Fluids: R21, DEF
Category: Solubility

Data No.: A192-05
Fluids: R22, DEF
Category: Solubility

Data No.: A192-06
Fluids: R21, EFA
Category: Solubility

Data No.: A192-07
Fluids: R21, DMAn
Category: Solubility

Data No.: A192-08
Fluids: R21, CA
Category: Solubility

Data No.: A192-09
Fluids: R21, AN
Category: Solubility

Data No.: A192-10
Fluids: R21, OCA
Category: Solubility

Data No.: A192-11
Fluids: R21, OC
Category: Solubility

Data No.: A192-12
Fluids: R21, MM
Category: Solubility

Data No.: A192-13
Fluids: R21, NB
Category: Solubility

Data No.: A192-14
Fluids: R21, TAN, DMF
Category: Solubility
Conc.: TAN:DMF=1.07:1(mol)

Data No.: A192-15
Fluids: R21, DMETEG, TAN
Category: Solubility
Conc.: DMETEG:TAN=1.03:1(mol)

Data No.: A192-16
Fluids: R22, DMETEG, TAN
Category: Solubility
Conc.: TAN:DMETEG=1.41:1(mol)

Data No.: A192-17
Fluids: R21, AN, DMF
Category: Solubility
Conc.: AN:DMF=0.99:1(mol)

Data No.: A192-18
Fluids: R21, DMETEG, TEPA
Category: Solubility
Conc.: DMETEG:TEPA=0.97:1(mol)

Data No.: A192-19
Fluids: R22, DMETEG, DMF
Category: Solubility
Conc.: DMETEG:DMF=0.82:1(mol)

Data No.: A192-20
Fluids: R21, DMETEG, DMF
Category: Solubility
Conc.: DMETEG:DMF=0.39,1.03,3.50(by mol)

Author(s): Tyagi,K.P.
Title: Pressure-temperature-concentration equations for vapour absorption binary mixtures.
Source: J. Heat Recovery Systems, Vol.4, No.3, 1984, P181-185.
Paper No.: D190 Language: English
Reviewer: Japan-C Doc.type: Journal
Comment: (1) Showed the P-T-X relations for refrigerant-absorbent binary system in a polynomial expression. (2) Reasonable relations were obtained for the range 0.2<x<0.8 within a 5% error at max.(3)The accuracy drops about a 10% error at max for 0.15<x<0.85.

Data No.: D190-01
Fluids: AM, 1,4BDL
Category: PVT-X
Pressure: 400psia
Temp.: 30～ 100℃
Conc.: 0.1～1.0 (NH3)

Data No.: D190-02
Fluids: R22, DMF
Category: PVT-X
Temp.: 40～95℃
Conc.: 0.2～0.9 (R22)

Data No.: D190-03
Fluids: DMA
Category: PVT-X

Data No.: D190-04
Fluids: SO2, DMA
Category: PVT-X

Data No.: D190-05
Fluids: R21, DMF
Category: PVT-X

Data No.: D190-06
Fluids: R21, DEF
Category: PVT-X

Data No.: D190-07
Fluids: NH3, 2,3BDL
Category: PVT-X

Data No.: D190-08
Fluids: R22, DEF
Category: PVT-X

Author(s): Uemura,T. Hasaba,S.
Title: 吸収冷凍機の冷媒水溶液の熱伝導度について
Title Eng: Thermal conductivity of lithium bromide-water and monoethylamine-water solutions.
Source: 冷凍; Refrigeration, Vol.38, No.427, p397, 1963.
Paper No.: B217 Language: Japanese
Reviewer: Japan-F Doc.type: Journal
Comment: Measured the thermal conductivity of H2O-LiBr system and monoethylamine-water system by means of a double glass pipe apparatus. The preliminary test results coincided with the

literature values, proving the favorable measurement accuracy. When compared with the values calculated by Riedel's formula, about 10% error occurs. In any case, these data are very precious.

Data No.: B217-01
Fluids: WA, LB
Category: Thermal_conductivity

Data No.: B217-02
Fluids: EA, WA
Category: Thermal_conductivity

Author(s): Uemura,T. Hasaba,S.
Title: Studies on the lithium bromide-water absorption refrigerating machine,
Source: Technology Report of Kansai University, F.565, No.6, 1964.
Paper No.: B214 Language: English
Reviewer: Japan-F Doc.type: Report
Comment: Reports various types of data on LiBr-H2O system which is the basic working fluid, and can be widely utilized in daily research activities.

Data No.: B214-01
Fluids: WA, LB
Category: PVT-X, Enthalpy
Viscosity

Author(s): Uemura,T. Hasaba,S. Higuchi, Y.
Tanaka,K. Ikenaga,S.
Title: リチウム・クロライドー水系吸収式冷凍機の研究（そのII）リチウムクロライド水溶液の比熱及び混合熱の測定
Title Eng: Some thermal properties of lithium chloride-water solutions for the designing of absorption refrigerating machine.
Source: 冷凍; Refrigeration, Vol.40, No.454, p671, 1965.
Paper No.: B219 Language: Japanese
Reviewer: Japan-F Doc.type: Journal
Comment: By measuring the specific heat of lithium chloride-water system within the concentration range of 8.23wt%~ 47.88wt% and temperature range of 10℃~110℃, data were subjected to quadric function approximation. Deviation between the approximation equation and measurement values fell within about 3%. Also, by measuring the differential heat of dilution, the results were used to measure the integral heat of dissolution, in combination with data on the differential heat of solution presented by Lange et al.

Data No.: B219-01
Fluids: WA, LC
Category: Enthalpy, Specific_heat
Temp.: 10~100℃
Conc.: 8.23~47.88 wt%

Author(s): Uemura,T. Higuchi,Y. Hasaba,S.
Title: リチウム・クロライドー水系吸収式冷凍機の研究（その3） リチウム・クロライドー水系のエンタルピー濃度線図の作成とそれを用いた考察
Title Eng: Enthalpy-concentration diagram of lithium chloride-water system for designing absorption refrigerating machine.

Source: 冷凍; Refrigeration, Vol.40, No.456, p847, 1965.

Paper No.: B220 Language: Japanese
Reviewer: Japan-F Doc.type: Journal
Comment: (1) Produced an enthalpy-concentration-temperature chart from data on physical properties, and took up an example of efficiency calculation upon assuming operating conditions. (2) At present, the same method is employed for efficiency calculation, and this method is not new.

Data No.: B220-01
Fluids: WA, LC
Category: Enthalpy, COP

Author(s): Uemura,T. Higuchi,Y. Toda,K. Hasaba,S.
Title: リチウム・クロライドー水系吸収式冷凍機の研究(その1) リチウム・クロライド水溶液の蒸気圧について
Title Eng: Vapor pressures of aqueous solutions of lithium chloride.
Source: 冷凍; Refrigeration, Vol.40, No.454, p665, 1965.
Paper No.: B225 Language: Japanese
Reviewer: Japan-F Doc.type: Journal
Comment: By measuring the vapor pressure of lithium chloride-water system, relations between vapor pressure and temperature are shown. By approximating the measurement values with two approximation formulas, derivations of the values obtained by the two approximation formulas from the measured values were examined. These values were compared with those in the literature. A deviation between the measurement values and approximation formula is a little smaller when Davis' formula is employed. A large error occurs at low vapor temperature between the literature values and measurement values.

Data No.: B225-01
Fluids: WA, LC
Category: PVT-X
Pressure: 2000~93325 Pa
Temp.: 30~120℃
Conc.: 11~47 wt%

Author(s): Uemura,T. Higuchi, Y. Kano,M. Hasaba,S.
Title: 水酸化ナトリウムー水系エンタルピー濃度線図の作成とそれを用いた考察
Title Eng: Entalpy-concentration chart for sodium hryoxide-water system.
Source: Kogaku To Gisitu, Vol.2, No.3, 1966.
Paper No.: B221 Language: Japanese
Reviewer: Japan-F Doc.type: Journal
Comment: NaOH-H2O system is inferior in the COP of a single-effect heat pump to LiCl-H2O system. (LiCl/H2O > LiBr/H2O > NaOH/H2O). However, under high condensation temperature, NaOH-H2O system has the widest operating range. Corrosiveness is not taken into account.

Data No.: B221-01
Fluids: WA, SH
Category: Solubility, Enthalpy COP

Author(s): Uemura,T. Higuchi,Y. Saito,Y.
Hasaba,S.
Title: エチルアミン一水系吸収式冷凍機の研究
Title Eng: Studies on the monoethylamine-water absorption refrigerating machine.
Source: 冷凍; Refrigeration, Vol.41, No.468, P973-986, 1966.
Paper No.: B222 Language: Japanese
Reviewer: Japan-F Doc.type: Journal
Comment: Although this system is inferior in the COP to conventional systems (ammonia-water system and LiBr-water system), it may have favorable characteristics when the operating conditions are fixed.

Data No.: B222-01
Fluids: EA, WA
Category: PVT-X, Enthalpy
COP

Author(s): Uemura,T. Higuchi,Y. Seki,A.
Hasaba,S.
Title: リチウム・クロライド一水系のエントロピー濃度線図の作成とそれを用いた考察
Title Eng: Entropy-concentration chart for lithium chloride-water system.
Source: 冷凍; Refrigeration, Vol.41, No.463, p391, 1966.
Paper No.: B224 Language: Japanese
Reviewer: Japan-F Doc.type: Journal
Comment: Offers a basic calculation method which will be useful for calculating the heat balance of an absorption refrigerating machine. This basic method can also be utilized for calculating the heat balance of the double-effect type.

Data No.: B224-01
Fluids: WA, LC
Category: Others, Refrigerating_machine
Memo1: Entropy data are reported.

Author(s): Uemura,T.
Title: Studies on the lithium chloride-water absorption refrigerating machine.
Source: Tech. Reps. Of Kansai University. No.9. 71. 1967.
Paper No.: B205 Language: English
Reviewer: Japan-F Doc.type: Report
Comment: This paper is important, since physical properties of this type of working pairs are measured systemtically. However, accuracy of measurement of thermal conductivity is uncertain.

Data No.: B205-01
Fluids: WA, LC
Category: PVT-X, Enthalpy
COP

Author(s): Uemura,T. Higuchi,Y. Saito,Y.
Hasaba,S.
Title: モノメチル・アミンー水系吸収式冷凍機の研究
Title Eng: Studies on the mono-methylamine-water absorption refrigerating machine.
Source: 冷凍; Refrigeration, Vol.42, No.471, p2, 1967.
Paper No.: B223 Language: Japanese
Reviewer: Japan-F Doc.type: Journal
Comment: Physical properties described in this paper represent values when temperature is 0～50℃ and concentration is 5～40wt%. Therefore, when performing heat calculation for refrigerating machines, air conditioners and heat pumps, the smoothed values are employed.

Data No.: B223-01
Fluids: MA, WA
Category: PVT-X, Enthalpy
COP
Temp.: 0～50℃
Conc.: 5～40 wt%

Author(s): Uemura,T. Ikenaga,W. Hasaba,S.
Title: R21,R22-N,N ジメチルホルムアミド系溶液の諸物性
Title Eng: Physical properties of the binary system, R21 of R22-N. N dimethylformamide.
Source: 冷凍; Refrigeration, Vol.42, No.478, p626, 1967.
Paper No.: B226 Language: Japanese
Reviewer: Japan-F Doc.type: Journal
Comment: The index of refraction, specific gravity, viscosity and surface tension of R21-DMF and R22-DMF were measured. Although the measurement ranges for specific gravity, viscosity and surface tension are a little narrower than the practical ranges, they are enough in accuracy for an design. Although eligibility of this system for practical use must be judged by taking account of other physical properties, the measured values shown here are favorable for use in absorption heat pumps.

Data No.: B226-01
Fluids: R21, DMF
Category: PVT-X, Viscosity
Surface_tension, Others
Temp.: 5～50℃
Conc.: 0～75 wt%
Memo1: Refractive index is reported.

Data No.: B226-02
Fluids: R22, DMF
Category: PVT-X, Viscosity
Surface_tension, Others
Temp.: 5～50℃
Conc.: 0～30 wt%

Author(s): Uemura,T. Hasaba,S.
Title: メタノールーリチウム・ブロマイド系吸収式冷凍機の研究
Title Eng: Investigation of absorption refrigerating machine operating on solution of methanol and lithium-bromide.
Source: 冷凍; Refrigeration, Vol.43, No.490, p1, 1968.
Paper No.: B211 Language: Japanese

Reviewer: Japan-E Doc.type: Journal
Comment: Methanol-lithium bromide system used for refrigeration (Te=-10℃ level) has a potential to excel in COP.

Data No.: B211-01
Fluids: MA1, LB
Category: Enthalpy, COP

Author(s): Uemura,T. Hasaba,S.
Title: R22-吸収剤系吸収式冷凍機の研究
Title Eng: Studies on the R22-Absorbent absorption refrigerating machine.
Source: 冷凍; Refrigeration, Vol.43, No.494, p1241, 1968.
Paper No.: B216 Language: Japanese
Reviewer: Japan-F Doc.type: Journal
Comment: Detailed data on physical properties are reported. Compared to the preceding report on R22-E181 and R22-DBP systems, R22-DMF system is specially excellent. It can also deliver similar COP to that of NH3-H2O system. The problem of this system is thought to lie in large pump power.

Data No.: B216-01
Fluids: R22, DMF
Category: PVT-X, Enthalpy
COP

Data No.: B216-02
Fluids: R22, IBA
Category: PVT-X, Enthalpy
COP

Author(s): Uemura,T. Hasaba,S.
Title: 水ーリチウム・ブロマイドーリチウム・クロライド系の蒸気圧
Title Eng: Vapor pressure of H2O-LiBr-LiCl system.
Source: 冷凍; Refrigeration, Vol.44, No.502, p717, 1969.
Paper No.: B218 Language: Japanese
Reviewer: Japan-F Doc.type: Journal
Comment: Vapor pressure of ternary H2O-LiBr-LiCl system was calculated estimatively from data on binary H2O-LiBr and H2O-LiCl systems, and compared with the actual measurement data. When employing an estimation method in which vapor pressure of the salt equal to the ionic intensity in the mixed liquid is added, a value close to the actual measurement value can be obtained.

Data No.: B218-01
Fluids: WA, LB, LC
Category: PVT-X
Conc.: 60 wt% (H2O)

Author(s): Uemura,T. Hasaba,S.
Title: 水ーリチウム・ブロマイドーリチウム・クロライド系の物性値について
Title Eng: Some physical properties of aqueous solution of lithium-bromide-lithium chloride mixture.
Source: 冷凍; Refrigeration, Vol.45, No.516, p31, October 1970,
Paper No.: B213 Language: Japanese
Reviewer: Japan-F Doc.type: Journal

Comment: (1) LiBr:LiCl=2:1 in molar ratio. When the experimental results of PVT-X were compared with values caluculated with the estimation methods, it was found that, in a high concentration region, values estimated by the following method agreed well with the actual measurement values, compared with the other two estimation methods. The vapor pressure of the salt equal to the ionic intensity in the mixed liquid is added. (2) Even with this method, a large error occurs, and it cannot be put to practical use. In fact, it has not been commercialized. (3) However, it will be useful if it can estimate vapor pressure with high accuracy.

Data No.: B213-01
Fluids: WA, LB, LC
Category: PVT-X, Others
Conc.: 10～40 wt%
Memo1: Refractive index is reported.

Author(s): Uemura,T.
Title: 水ーリチウム・ブロマイドーエチレン・グリコール系の比熱について
Title Eng: Studies on the specific heat of water-lithium bromide-ethyleneglycol system.
Source: 冷凍; Refrigeration, Vol.47, No.532, p103, 1972.
Paper No.: B209 Language: Japanese
Reviewer: Japan-E Doc.type: Journal
Comment: By experimentally obtaining the specific heat of ternary water-lithium bromide-ethylene glycol system, the experimental formula was presented in the form of quadric function. The specific heat according to the experimental formula was smaller than the specific heat calculated by assuming that ideal mixing takes place. Thus, as far as this type of specific heat is concerned, there seems to be no other methods than actual measurement. The average deviation of the experimental value from the experimental formula was 0.5%. LiBr concentration: 5～50wt%.

Data No.: B209-01
Fluids: WA, LB, EG
Category: Specific_heat
Conc.: 5～50 wt% (LiBr)

Author(s): Uemura,T.
Title: メタノールー吸収剤系の蒸気圧について
Title Eng: The vapor pressure of methanol-absorbent systems.
Source: 冷凍; Refrigeration, Vol.47, No.532, p105, 1972.
Paper No.: B210 Language: Japanese
Reviewer: Japan-E Doc.type: Journal
Comment: It is proposed that a practical equation for calculating vapor pressure can be obtained by multiplying Raoult's formula by a correction factor, f, which is expressed by a linear equation of solution concentration. In future, it must be examined whether or not systems other than CH3OH/LiBr and CH3OH/LiBr/ZnBr2 can be approximated by a similar linear equation.

Data No.: B210-01

Fluids: MAl, LB
Category: PVT-X
Conc.: 10～37%

Data No.: B210-02
Fluids: MAl, LB, ZB
Category: PVT-X
Conc.: 10～37%

Author(s): Uemura,T.
Title: Die physikalischen und thermodynamischen Eigenschaften des ternären Systems methanol-litiumiodid-zinkbromid.
Title Eng: Physical and thermodynamic characteristics of the ternary system methanol - lithiumbromide - zincbromide.
Source: Klima-Kälte-Technik. Vol.15. Heft 1. 6-12. 1973.
Paper No.: B194 Language: German
Reviewer: Japan-E Doc.type:

Author(s): Uemura,T.
Title: R21-ジメチル・ホルムアミド系吸収冷凍機について
Title Eng: Studies on the R21-Dimethylformamide absorption refrigeration.
Source: 冷凍; Refrigeration, Vol.48, No.551, p842, 1973.
Paper No.: B208 Language: Japanese
Reviewer: Japan-E Doc.type: Journal
Comment: Presented a calculation formula by experimenting with vapor pressure, specific heat and heat of mixing of R21-DMF system. The deviation of actual measurement value from the calculated one was in the order of several %. COPs of various types of single-stage absorption refrigerating machines using R21-DMF were also calculated, and compared with those obtained by other absorbent-refrigerant systems. Although R21 features a high COP as refrigerant, it has problems concerning chemical stability, cost, etc.

Data No.: B208-01
Fluids: R21, DMF
Category: PVT-X, Specific_heat
COP

Author(s): Uemura,T.
Title: 水ーリチウムブロマイド系吸収式冷凍機の添加剤について
Title Eng: A study on inhibitors for water-lithium bromide absorption refrigerating machines.
Source: 第9回空気調和・冷凍連合講演会講演論文集; Proc. 9th Air-Cond. Refrig. Conf., p.57, 1975.
Paper No.: D219 Language: Japanese
Reviewer: Japan-C Doc.type: Conference
Comment: (1) The surface tension of LiBr solution added with about 40 types of additive (0.05wt%) at 40℃ were measured , and it was found that octyl alcohol, hexyl alcohol, ethylene glycol, dibutyl ether, nonyl phenyl alcohol, lauryl alcohol and Span 20 were effective. Measured the surface tension when each such additive was added at 20～80℃. (2) By adding 0.05wt% of octyl alcohol, measured the vapor pressure of LiBr solution, and confirmed a drop in the low temperature region under 80℃.

Data No.: D219-01
Fluids: WA, LB, OA1
Category: PVT-X, Surface_tension
Temp.: 15～80℃
Conc.: 0.05wt%(Surfactant)

Data No.: D219-02
Fluids: WA, LB, HA1
Category: Surface_tension
Temp.: 20～80℃
Conc.: 0.05wt%(Surfactant)

Data No.: D219-03
Fluids: WA, LB, DBEEG
Category: Surface_tension
Temp.: 20～80℃
Conc.: 0.05wt% (Surfactant)

Data No.: D219-04
Fluids: WA, LB, NPA1
Category: Surface_tension
Temp.: 20～80℃
Conc.: 0.05wt%(Surfactant)

Data No.: D219-05
Fluids: WA, LB, DDA1
Category: Surface_tension
Temp.: 20～80℃
Conc.: 0.05wt%(Surfactant)

Author(s): Uemura,T.
Title: エタノール－リチウムブロマイド系吸収式冷凍機について
Title Eng: Studies on the ethanol-lithium bromide refrigeration machine.
Source: 冷凍; Refrigeration, Vol.50, No.568, p89, February 1975.
Paper No.: B199 Language: Japanese
Reviewer: Japan-E Doc.type: Journal
Comment: Research on one of alcoholic refrigerant-LiBr systems, following that on methanol systems, Ontained the COP by measuring physical properties, and performing simulation of an absorption refrigerating machine based on those values. At the same time, calculated the COP of CH3OH-LiBr, CH3OH-LiBr-ZnBr2 and CH3OH-LiI-ZnBr2, showing that these values mostly agree with each other. Although this system has a narrow operating temperature range due to small solubility of LiBr, it is suitable for utilization of the solar heat.

Data No.: B199-01
Fluids: EA1, LB
Category: PVT-X, Viscosity
COP

Author(s): Uemura,T.
Title: メタノール－リチウム・アイオダイド－ジンク・ブロマイド系吸収冷凍機について
Title Eng: Studies on the methanol-lithium iodide-zinc bromide absorption refrigerating machine.

Source: 冷凍; Refrigeration, Vol.50, No.568, p95, 1975.
Paper No.: B206 Language: Japanese
Reviewer: Japan-E Doc.type: Journal
Comment: By obtaining physical and thermodynamic properties of CH3OH-LiI-ZnBr2 system, prepared an enthalpy-concentration chart. Based on these properties, evaluated working characteristics and COP of an absorption refrigerating machine. Evaluating of this system as used in the absorption refrigerating machine is made solely from the point of view of thermodynamic properties. When putting it in practical use, it is desirable that overall evaluation be made, by taking account of toxicity, corrosiveness and heat transfer performance. In practical use, it is useful to have a rough information.

Data No.: B206-01
Fluids: MA1, LI, ZB
Category: PVT-X, Specific_heat
COP

Author(s): Uemura,T.
Title: Addition agents used for the H2O-LiBr absorption refrigetors .
Source: Paper presented at 10th Conference of Air Conditioning and Refrigeration. Tokyo. 4/22. 1976.
Paper No.: B193 Language: Japanese
Reviewer: Japan-E Doc.type:

Author(s): Uemura,T.
Title: メタノールージンク・ブロマイド系吸収式冷凍機について
Title Eng: Studies on the methanol-zinc bromide absorption refrigerating machine.
Source: 冷凍; Refrigeration, Vol.51, No.590, p1027, December 1976.
Paper No.: B207 Language: Japanese
Reviewer: Japan-E Doc.type: Journal
Comment: (1) By experimentally obtaining physical and thermodynamic properties of methanol-ZnBr2 sytem, presented an experimental formula, etc. (2) By obtaining working characteristics of this system and other alcoholic systems, performance is compared between single and double-effect absorption refrigerating machines. Although this system is inferior in COP to the other systems, it is advantageous in that it has a wide operating range and, among others, can work with a low temperature heat source.

Data No.: B207-01
Fluids: MA1, ZB
Category: PVT-X, Viscosity
COP

Author(s): Uemura,T.
Title: 吸収式冷凍機用冷媒－吸収剤の物性
Title Eng: Properties of refrigerant-absorbent system used for absorption refrigeration.
Source: 冷凍; Refrigeration, Vol.52, No.600, p65, October 1977.
Paper No.: B198 Language: Japanese
Reviewer: Japan-E Doc.type: Journal

Comment: By dividing refrigerant-absorbent systems for absorption refrigerating machines into four types according to refrigerant types (water, alcohol, ammonia and CFC), this paper introduces measurement values of physical and thermal properties which have been already reported, as well as charts obtained by using those measurement values. At present, only NH3-H2O and H2O-LiBr systems are actually put to commercial use, while the other systems remain at the stage of trial production.

Author(s): Uemura,T.
Title: Studies on the inhibitors used for the H2O-LiBr absorption r efrigerators.
Source: Paper presented at 12th Conference of Air Conditioning and Refrigeration. Tokyo. 4/19. 1978.
Paper No.: B204 Language: Japanese
Reviewer: Japan-E Doc.type:

Author(s): Uemura,T.
Title: Inhibitors used for H2O-LiBr-LiSCN absorption refrigerators.
Source: Paper presented at 1981 Japan Refrigeration Conference.
Paper No.: B196 Language: Japanese
Reviewer: Japan-E Doc.type:

Author(s): Uemura,T. Iyoki,S.
Title: H2O-LiBr-ZnCl2 系吸収冷凍機について（第一報）
Title Eng: A study on the water-lithium bromide-zinc cloride refrigerating machine.
Source: 日本冷凍協会学術講演会論文集; Proc. JAR Annual Conf., 1982, p17-20.
Paper No.: D246 Language: Japanese
Reviewer: Doc.type: Conference

Author(s): Uemura,T. Koshiyama,H. Iyoki,S.
Title: C2H5OH-LiI 系吸収冷凍機について
Title Eng: A study on the ethanol-lithium iodide absorption refrigerating machine.
Source: 第16回空気調和・冷凍連合講演会講演論文集; Proc. 16th Air-Cond. Refrig. Conf. Japan, 1982, p105-108.
Paper No.: D254 Language: Japanese
Reviewer: Doc.type: Conference

Author(s): Usyukin,I.P.
Title: Thermodynamic curves of lithium bromide-water solutions,
Source: Khold. Tekh. 4(1), P.25-29, 1969,
Paper No.: B227 Language: English
Reviewer: Doc.type:

Author(s): Weil,S.A.
Title: Thermodynamic properties of lithium chloride-lithium bromide-water system,
Source: Unpublished Report, IGT Project No.S-153 for the foote Mineral Co. and American Gas Association. Chicago: Institute of Gas Technology, 1960 February,

Paper No.: A229 Language: English
Reviewer: Japan-H Doc.type:

Author(s): Westermark,M.
Title: Development of new absorption medium H2O/inorganic salt(liq).
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C275 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings
Comment: Outlines R&D financed by the National Swedish Board for Technical Development. Although inorganic salt system resembles H2O/LiBr system, its temperature rising width is as high as 70℃ and COP is also 1.75. A 5KW bench scale heat pump was prepared to examine problems to be solved for actual application, such as corrosion evaluation and those related to operation, with a view to constructing a 100~200kW demonstration plant. No reference literature given.

Author(s): Working group reports
Title: Fluid pairs for high temperature and industrial application.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C276 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings
Comment: Since an industrial absorption heat pump requires a high level of high temperature or low temperature heat-source, working fluids and technologies for air conditioning heat pump are not enough. Thus, this paper describes development of suitable systems to be pursued with short-/mid-term goals of collecting high temperature side data on LiBr/H2O, NH4/H2O and LiBr/NH4/H2O, and studying heat/mass simultaneous transfer phenomena, and with a long-term goal of finding out fluids better than LiBr/H2O and NH4/H2O.

Author(s): Working group reports
Title: Fluid pairs of multi-stage and novel systems.
Source: New working pairs for absorption processes, 1983, Swedish council for building research
Paper No.: C277 Language: English
Reviewer: Japan-B Doc.type: Conference proceedings
Comment: Gives a generalizes account of effects caused by cycle improvements upon physical properties required for working fluids, covering general roles of fluids and system improvements for single-stage absorption heat pump cycles (type 1 and type 2), compression-absorption systems, auxiliary fluid systems and multi-stage cycles.

Author(s): Wucherer,J.
Title: Messung von Druk, Temperatur und Zusammensetzung der flüssigen und dampfförmigen Phase von Am moniak-Wassergemischen im Sättigungszustand.
Title Eng: Measurements of pressure, temperature and composition of liquids and vapor phase of ammonia-water mixtures at the saturation point.

Source: Z. Gesamt. Kälte-Ind., 39, p97-104, p136-140, 1932.
Paper No.: B234 Language: German
Reviewer: Japan-J Doc.type: Journal
Comment: Although this paper discusses thermodynamic properties of ammonia solution at length, the data are old. Accuracy: composition ±0.005, pressure 506Pa, temperature ±0.06℃.

Data No.: B234-01
Fluids: AM, WA
Category: PVT-X
Pressure: 0.1~20at;0.098~19.6bar
Temp.: -50~210℃

Author(s): Yaron,I.
Title: The thermodynamic properties of the system dichloromonofluoromethhane-dimethyl ether of tetraethylene glycol,
Source: Ben-Gurion University of the Neger Institutes for the Applied Research, Internal Report, undated,
Paper No.: B235 Language: English
Reviewer: Japan-A Doc.type: -

Author(s): Zellhoeffer,G.F.
Title: Solubility of halogenated hydrocarbon refrigerants in organic solvents.
Source: Ind. Eng. Chem., 29, 1937 May, p548.
Paper No.: B239 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Widely examines solubility of several types of CFC into organic solvent.

Author(s): Zellhoeffer,G.F.
Title: Commercial refrigeration by low pressure steam.
Source: J. ASRE, p317-320, 1937 May.
Paper No.: A242 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Predicts performance of the R21-DMETEG refrigerating machine.

Data No.: A242-01
Fluids: R21, DMETEG
Category: Refrigerating_machine

Author(s): Zellhoeffer,G.F. Copley,M.J. Marvel,C.S.
Title: Hydrogen bonds involving the C-H link. The solubility of haloforms in donor solvents.
Source: J. Am. Chem. Soc., 60, p1337-43, 1938 June.
Paper No.: A240 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Attempts to explain about differences in solubility of various types of halogenated hydrocarbon in terms of hydrogen bond.

Author(s): Zellhoeffer,G.F. Copley,M.J.
Title: The heats of mixing haloforms and polythylene glycol ethers
Source: J. Am. Chem. Soc., 60, p1343-45, 1938 June.
Paper No.: A241 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Measured 4 kinds of heat of mixing of chloroform, R21, DMEEG and DMETEG, and based on the results, estimated the ratio of molecules forming hydrogen bond.

Data No.: A241-01
Fluids: CF, DMEEG
Category: Enthalpy
Temp.: 3℃

Data No.: A241-02
Fluids: CF, DMETEG
Category: Enthalpy
Temp.: 3℃

Data No.: A241-03
Fluids: R21, DMEEG
Category: Enthalpy
Temp.: 3℃

Data No.: A241-04
Fluids: R21, DMETEG
Category: Enthalpy
Temp.: 3℃

Author(s): Ziegler,B. Trepp,Ch.
Title: Equation of state for ammonia-water mixtures.
Source: International Jounal of Refrigeration, Vol.7, No.2, March 1984.
Paper No.: B244 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: By means of a equation of state formulated based on the past data, a vapor pressure chart and co ncentration-enthalpy chart were prepared.

Data No.: B244-01
Fluids: AM, WA
Category: PVT-X, Enthalpy
Pressure: 0.2~50bar
Temp.: -40~220℃

Author(s): Zinner,K.
Title: Wärmetönung beim Mischen von Ammoniak und Wasser in Abhängigkeit von Zusammensetzung und Temperatur.
Title Eng: The heat content of mixtures of ammonia and water dependent on the composition and temperature.
Source: Z. Gesamt. Kälte-Ind., 41, p21-29, February 1934.
Paper No.: B245 Language: German
Reviewer: Japan-J Doc.type: Journal

Data No.: B245-01
Fluids: AM, WA
Category: Enthalpy

Author(s): Zyukanov,V.M. Baranenko,A.V. Orekhov,I.I.
Title: Surface tension of an aqueous solution of lithium bromide with surfactants.
Source: Chem. Abs., Vol.104, 24589
Paper No.: E030 Language: Russian
Reviewer: Doc.type: Journal

1.4.2 References on Transport Phenomena

Author(s): Brauner,N. Moalem Maron, D. Sideman,S.
Title: Heat and mass transfer in direct contact hygroscopic condensation.
Source: Waerme- & Stoffuebertrag. (Germany), 1987, vol.21, no.4, P.233-45.
Paper No.: D019 Language: German
Reviewer: Germany Doc.type: Journal
Comment: A physical model is presented for the analysis of the combined heat and mass transfer process involved in a hydroscopic condensation of vapor over a falling film of a concentrated salt solution.

Data No.: D019-01
Fluids: WA, salt
Category: Absorber_(Absorption), Condenser_(Condensation) Vertical, Inside_of_tube

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Author(s): Burdukov,A.P. Bufetov,N.S. Deriy,N.P. Dorokhov,A.R. Kazakov,V.I.
Title: Experimental study of the absorption of water vapor by thin films of aqueous lithium bromide.
Source: Heat Transfer Soviet Research, Vol.12, No.3, 1980, p118-123.
Paper No.: D268 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: By experimenting with various types of absorbers, reveals that results agree well with a model that represents a complete mixture due to waves. The paper also reveals that mass transfer coefficients deteriorates significantly due to a non-condensable gas.

Data No.: D268-01
Fluids: WA, LB
Category: Absorber_(Absorption), Horizontal Vertical

Author(s): Burnett,J.C. Himmelblau,D.M.
Title: The effect of surface active agents on interphase mass transfer.
Source: AIChE J., Vol.16, No.2, p185-193, 1970, March.
Paper No.: B043 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: In order to examine the effect of surface active agents upon absorption of ammonia into water, 19 types of organic compound were added to water to experiment with it.

Data No.: B043-01
Fluids: AM, WA
Category: Absorber_(Absorption), Others
Temp.: 25.5℃

Data No.: B043-02
Fluids: AM, WA, HAl
Category: Absorber_(Absorption), Others
Temp.: 25.5℃

1.4.2 References on Transport Phenomena

Data No.: B043-03
Fluids: AM, WA, OAl
Category: Absorber_(Absorption), Others
Temp.: 25.5℃

Data No.: B043-04
Fluids: AM, WA, DAl
Category: Absorber_(Absorption), Others
Temp.: 25.5℃

Data No.: B043-05
Fluids: AM, WA, DDAl
Category: Absorber_(Absorption), Others
Temp.: 25.5℃

Data No.: B043-06
Fluids: AM, WA, TDAl
Category: Absorber_(Absorption), Others
Temp.: 25.5℃

Data No.: B043-07
Fluids: AM, WA, HDAl
Category: Absorber_(Absorption), Others
Temp.: 25.5℃

Data No.: B043-08
Fluids: AM, WA, ODAl
Category: Absorber_(Absorption), Others
Temp.: 25.5℃

Data No.: B043-09
Fluids: AM, WA, EiAl
Category: Absorber_(Absorption), Others
Temp.: 25.5℃

Data No.: B043-10
Fluids: AMO, WA, DoAl
Category: Absorber_(Absorption), Others
Temp.: 25.5℃

Data No.: B043-11
Fluids: AM, WA, HAm
Category: Absorber_(Absorption), Others
Temp.: 25.5℃

Data No.: B043-12
Fluids: AM, WA, DAm
Category: Absorber_(Absorption), Others
Temp.: 25.5℃

Data No.: B043-13
Fluids: AM, WA, TDAm
Category: Absorber_(Absorption), Others
Temp.: 25.5℃

Data No.: B043-14
Fluids: AM, WA, ODAm
Category: Absorber_(Absorption), Others
Temp.: 25.5℃

Data No.: B043-15
Fluids: AM, WA, DoAm
Category: Absorber_(Absorption), Others
Temp.: 25.5℃

Data No.: B043-16
Fluids: AM, WA, HAd
Category: Absorber_(Absorption), Others
Temp.: 25.5℃

Data No.: B043-17
Fluids: AM, WA, TDAd
Category: Absorber_(Absorption), Others
Temp.: 25.5℃

Data No.: B043-18
Fluids: AM, WA, ODAd
Category: Absorber_(Absorption), Others
Temp.: 25.5℃

Data No.: B043-19
Fluids: AM, WA, DoAd
Category: Absorber_(Absorption), Others
Temp.: 25.5℃

Author(s): Butz,Dieter Stephan,Karl
Title: Modeling and simulating the dynamic behavior of a falling film absorber.
Source: EUR-10007-EN; Comm. Eur. Communities, (Rep.) EUR (1985); Absorpt. Heat Pumps Congr. P.126-37.
Corp_src: Comm. Eur. Communities
Paper No.: D021 Language: English
Reviewer: Japan-E Doc.type: Report; Conference
Comment: Although an absorber is divided in each of vapor and liquid phases, it is unknown as to how it is divided in the direction of liquid phase thickness. When the number of division in the direction of liquid phase thickness is 1, distribution (in the direction of film thickness) of concentrations and temperatures in the absorbent may not be expressed correctly, since it is supposed that absorbent and refrigerant vapor are in an equilibrium. Since the details of the model are unknown, validity of the calculation results cannot be evaluated.

Data No.: D021-01
Fluids: AM, WA
Category: Absorber_(Absorption)

Author(s): Dorokhov,A.R. Bochagov,V.N.
Title: Heat transfer in water and aqueous lithium bromide solutions on a polymer surface.
Source: Chem. Pet. Engineering, Vol.18, No.5, 1982, P238.
Paper No.: D196 Language: English
Reviewer: Japan-I Doc.type: Journal
Comment: In order to prevent corrosion, polymers may be coated over the heat transfer tube. By using the coated heat transfer tube, performed a boiling heat transfer test in water and LiBr solution varying in concentration.

Data No.: D196-01
Fluids: WA, LB
Category: Generator

Author(s): Fujita,T.
Title: 吸収式冷凍機・ヒートポンプにおける流下液膜
Title Eng: Falling liquid films in absorption machines.
Source: 日本冷凍協会論文集; Trans. JAR, Vol.5, No.1, 1988, p15-26.
Paper No.: D223 Language: Japanese
Reviewer: Japan-J Doc.type: Journal
Comment: This review deals with the following topics: (1)characteristics of thin liquid films over horizontal tubes; (2)characteristics of wavy thin liquid films flowing down along vertical and inclined wall surfaces; (3)effect of artificial roughness on the heat and mass transfer rate; (4)enhancement in heat and mass transfer rates by the Marangoni convection; (5)conditions of film breakdown and minimum wetting rates.

Author(s): Gabsi,S. Bugarel,R.
Title: Water absorption by a solution of lithium bromide in wetted wall colums with tangential feed.
Source: Int. Comm. Heat Mass Transfer, Vol.10, 1983, p49-58.
Paper No.: D261 Language: English
Reviewer: Japan-J Doc.type: Journal

Data No.: D261-01
Fluids: WA, LB
Category: Absorber_(Absorption)
Temp.: 70, 75, 80 C in evaporator
Conc.: 0.63 - 0.68 mass fraction of LiBr

Author(s): Gottier,G.N. Amundson,N.R. Flumerfelt,R.W.
Title: Transient dilation of bubbles and drops: theoretical basis for dynamic interfacial measurements.
Source: J. Colloid & Interface Sci. (USA), Nov. 1986, vol.114, no.1, P.106-30.
Paper No.: D051 Language: English
Reviewer: Japan-I Doc.type: Journal
Comment: This paper belongs to the field of surface chemistry, and as such, absorption/adsorption in this paper conceptually differ from those in the field of absorption/adsorption refrigerating machines. This paper analyzes the behaviors of bubbles and liquid drops in gas-liquid and liquid-liquid systems to derive general solutions and solutions in specific conditions, and compared them with values obtained through experiment. Specially, it introduces a method which gives vibrations to liquid drops and bubbles to analyze the phenomena occurring at tha. time.

Author(s): Grosman,E.R. Naumov,S.E.
Title: Determination of a heat transfer coefficient from the film of an aqueous solution of LiBr with isooctanol addition on a model of a trickling absorber.
Source: Chem. Abs., Vol.104, 21164
Paper No.: E031 Language: Russian
Reviewer: Doc.type: Journal

Author(s): Grossman,G
Title: Transfer modeling in an absorber
Source: EUR-10007-EN; Comm. Eur. Communities, (1985), B11.
Corp_src: Comm. Eur. Communities.
Paper No.: D197 Language: English
Reviewer: Japan-E Doc.type: Report; Conference
Comment: Explains about a model for simultaneous heat and mass transfer in the falling liquid film. The film Reynolds number characterizes the fluid dynamic properties of falling liquid film. Assumptions for obtaining temperature and concentration distributions in laminar and turbulent liquid film flows, and nondimensional parameters are described. In this way, solution are obtained under the conditions that the wall is adiabatic or isothermal. It is reported that heat and mass transfer can be augmented by disturbing the interface, and one of the methods is to add some surface active agent.

Data No.: D197-01
Fluids: NS
Category: Absorber_(Absorption), Vertical
Outside_of_tube

Author(s): Grossman,G.
Title: ADIABATIC ABSORPTION AND DESORPTION FOR IMPROVEMENT OF TEMPERATURE-BOOSTING ABSORPTION HEAT PUMPS.
Source: ASHRAE Trans., Vol.88, pt2, (1982), p.359-367.
Paper No.: D058 Language: English
Reviewer: Japan-I Doc.type: Journal
Comment: Taking up an absorption heat pump aimed to increase temperature, this paper discusses a method for improving the performance by adding a step that causes adiabatic changes in the absorber or generator, and evaluated the results in terms of COP.

Data No.: D058-01
Fluids: NS
Category: Heat_pump

Author(s): Grossman,G. Heath,M.T.
Title: Simultaneous heat and mass transfer in absorption of gases in turbulent liquid films.
Source: Int. J. Heat & Mass Transfer (GB), vol.27, no.12, P.2365-76, Dec. 1984.
Paper No.: D056 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Basic research analyzing heat and mass transfer in absorption of gas into the falling turbulent liquid film. By assuming analogy of heat and mass transfer, eddy diffusion coefficient in the liquid film is examined for each of three regions: near the wall, core of turbulent flow and near the surface. Since the results are not compared with the experiment, their validity and application range remain unknown.

Data No.: D056-01
Fluids: NS, NS
Category: Absorber_(Absorption), Flat_plate

Author(s): Grossman,G.
Title: Analysis of interdiffusion in film absorption.
Source: Int. J. Heat & Mass Transfer (GB), vol.30, no.1, P.205-8, Jan. 1987.
Paper No.: D057 Language: English
Reviewer: Japan-E Doc.type: Journal
Comment: Introduces an analytical model and equation system for heat and mass transfer phenomena in the falling liquid film by taking account of internal diffusion (heat transfer effect of mass diffusion). Although the internal diffusion is negligible for almost all of actual phenomena, it becomes important when absorbent-refrigerant vapor contacting time is short, and there exists a large temperature and concentration gradients in the falling liquid film.

Data No.: D057-01
Fluids: NS
Category: Absorber_(Absorption), Flat_plate

Author(s): Guha,D.K. De,P.
Title: Studies on mass transfer during drop formation in a pulsating gaseous medium.
Source: Can. J. Chem. Eng. (Canada), vol.63, no.4, P.565-71, Aug. 1985.
Paper No.: D063 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Research described in this paper is as follows: In an absorber in which liquid drops are produced from the nozzle and the liquid drops are caused to absorb gas, if the gas phase is given an adequate pulsation, it resonates with an internal circulating flow which occurred with liquid drops were formed, so that the internal circulating flow is prevented from attenuation, thus leading to an improved mass transfer. It is suggested that, in an adequate pulsation condition, mass transfer doubles when compared to that at the time of no pulsation.

Data No.: D063-01
Fluids: CDO, WA
Category: Absorber_(Absorption)
Pressure: atomospheric pressure
Temp.: 30℃

Author(s): Iedema,P.D.
Title: Heat and mass transfer in the horizontal tube bundle absorber.
Source: VDI-Ber. vol.539, P.985-1000, 1984.
Paper No.: D071 Language: English
Reviewer: Denmark Doc.type: Journal
Comment: Absorption outside horizontal tube bundle.

Data No.: D071-01
Fluids: MA1, LB, ZB

Category: Absorber_(Absorption), Horizontal
Pressure: 1.20-10.00 kPa
Temp.: 47.2-102.6 ℃
Conc.: 0.2802-0.3605 (mixture inlet)
Memo1: mixture temperature decrease: 12-47.2 K; mixture concentration outlet: 0.2981-0.3931

Author(s): Iedema,P.D. Minkhorst,J.H.
Title: Application of compact heat and mass exchangers in absorption systems.
Source: EUR-10007-EN, Comm. Eur. Communities, 1985, B16.
Corp_src: Comm. Eur. Communities.
Paper No.: D199 Language: English
Reviewer: Japan-J Doc.type: Report; Conference
Comment: Describes a plan for using a compact heat-mass exchanger built by soldering plate and corrugated panels in piles, as an absorption system. Intended to take up a resorption cycle. Concrete data are not given.

Data No.: D199-01
Fluids: AM, WA
Category: Absorber_(Absorption), Generator
Heat_exchanger

Author(s): Infante Ferreira,C.A Keizer,C. Machielsen,H.M.
Title: Heat and mass transfer in vertical tubular bubble absorbers for ammonia-water absorption refrigeration systems.
Source: Int. J. Refrig., Vol.7, No.6, 1984, p348-357.
Paper No.: D274 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: A model is developed for calculating simultanious heat and mass transfer processes in vertical tubular bubble absorbers as used for absorption refrigeration systems.

Data No.: D274-01
Fluids: AM, WA
Category: Absorber_(Absorption), Vertical
Inside_of_tube
Pressure: 1.26 - 3.33 bar
Temp.: 8.2 - 32 C
Conc.: 0.341 - 0.451

Author(s): Infante Ferreira,C.A Stolk,A.L.
Title: Comparison of falling film and vertical tubular absorbers for absorption heating/cooling systems.
Source: Sci. Tech. Froid, no.3, P.149-54, 1985.
Paper No.: D072 Language: English
Reviewer: Belgium Doc.type: Journal

Author(s): Infante Ferreira,C.A
Title: Combined momentum, heat and mass transfer in vertical slug flow absorbers.
Source: Int. J. Refrig., Vol.8, Nov. 1985, p327-334.
Paper No.: D276 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Conducted numerical analysis of and experiment with

vertical slug flow absorbers, and compared the results with the Nusselt theory for heat transfer and with the penetration model for mass transfer.

Data No.: D276-01
Fluids: AM, LN
Category: Absorber_(Absorption), Vertical
Inside_of_tube
Pressure: 120 - 370 kPa
Temp.: 15 - 40 C
Conc.: 0.35 - 0.45

Data No.: D276-02
Fluids: AM, ST
Category: Absorber_(Absorption), Vertical
Inside_of_tube
Pressure: 250 - 370 kPa
Temp.: 15 - 30 C
Conc.: 0.38 - 0.45

Author(s): Inoue,N.
Title: 吸収冷凍機の吸収器内の吸収作用について
Title Eng: A study of absorption in an absober for absorption refrigerating machines.
Source: 第7回空気調和・冷凍連合講演会講演論文集; Proc. 7th Air-Cond. Refrig. Conf., p39, 1973.
Paper No.: D213 Language: Japanese
Reviewer: Japan-I Doc.type: Conference
Comment: Theoretically analyzed absorption involving heat generation, and performed absorption experiment with LiBr-H2O. Both analytical and experimental results are given in terms of transfer coefficient.

Data No.: D213-01
Fluids: WA, LB
Category: Absorber_(Absorption)

Author(s): Inoue,N. Nagaoka,Y. Nishiyama,N.
Yabase,H.
Title: 吸収冷凍機の吸収器について（第2報）
Title Eng: A study of an absorber for absorption refrigerating machines.
Source: 空気調和衛生工学会学術論文集; Trans. SHASE of Japan, p141, 1986.
Paper No.: D208 Language: Japanese
Reviewer: Japan-I Doc.type: Conference

Data No.: D208-01
Fluids: WA, LB
Category: Absorber_(Absorption), Horizontal
Outside_of_tube

Author(s): Inoue,N. Nagaoka,Y. Nishiyama,N.
Yabase,H.
Title: 吸収冷凍機の吸収器について（第1報）
Title Eng: A study of an absorber for absorption refrigerating machines.

Source: 第20回空気調和・冷凍連合講演会講演論文集; Proc. 20th Air-Cond. Refrig. Cong. Japan, p1, 1986.
Paper No.: D209 Language: Japanese
Reviewer: Japan-I Doc.type: Conference
Comment: By performing an experiment on absorption for LiBr solution, calculates the heat transfer coefficient and mass transfer coefficient of an absorber. As the first report, introduces the experimental apparatus, calculation method, and effect of surface active agent in an absorber which uses plain tubes.

Data No.: D209-01
Fluids: WA, LB
Category: Absorber_(Absorption)

Author(s): Inoue,N.
Title: 吸収器性能の算定について
Title Eng: Performance of an absorber for absorption refrigerating machines.
Source: 第24回日本伝熱シンポジウム講演論文集; Proc. 24th National Heat Transfer Symposium of Japan, p498, 1987.
Paper No.: D203 Language: Japanese
Reviewer: Japan-I Doc.type: Conference
Comment: By converting mass transfer in an absorber from an expression at the concentration field to that at the temperature field, made it possible to grasp simultaneous transfer of heat and mass at the temperature field alone. Moreover, overall evaluation of absorber performance has been given neatly in terms of relations between concentration efficiency (ϕ) and NTU.

Data No.: D203-01
Fluids: NS
Category: Absorber_(Absorption)

Author(s): Inoue,N. Nagaoka,Y. Nishiyama,N. Yabase,H.
Title: 吸収冷凍機の吸収器について（第３報）
Title Eng: A study of an absorber for absorption refrigerating machines.
Source: 第21回空気調和・冷凍連合講演会講演論文集; Proc. 21th Air-Cond. Refrig. Conf. Japan, p85, 1987.
Paper No.: D210 Language: Japanese
Reviewer: Japan-I Doc.type: Conference
Comment: By using various types of heat transfer tube, experimented on absorption with LiBr-H2O system. Based on the measurement results, the paper examines a desirable development in shape of heat transfer tubes for absorbers.

Data No.: D210-01
Fluids: WA, LB
Category: Absorber_(Absorption), Horizontal Outside_of_tube

Author(s): Inoue,N.
Title: 吸収器における熱と物質の同時移動
Title Eng: Simultaneous heat and mass transfer in an absorber.

Source: 第21回空気調和・冷凍連合講演会講演論文集; Proc. 21th Air-Cond. Refrig. Conf. Japan, p89, 1987.
Paper No.: D211 Language: Japanese
Reviewer: Japan-I Doc.type: Conference
Comment: By converting the definition of absorbing speed in an absorber from that by concentration to that by temperature, the paper showed that even the conventional absorber calculation method based on temperature takes mass transfer into account. Also analyzes transfer speed in an absorber when noncondensable gas has entered.

Data No.: D211-01
Fluids: NS
Category: Absorber_(Absorption)

Author(s): Iyoki,S. Uemura,T.
Title: 水ーリチウム・ブロマイド系吸収式冷凍機の添加剤について
Title Eng: Studies on the surface-active agent of the lithium bromide-water absorption refrigerating machine.
Source: 冷凍; Refrigeration, Vol.52, No.591, p33, January 1977.
Paper No.: B088 Language: Japanese
Reviewer: Japan-I Doc.type: Journal
Comment: By adding various types of surface active agent to LiBr-H2O, measured a surface tension drop and vapor pressure drop, and reports that effective additives, whose surface tension does not drop in the high temperature region, include 4-methyl decanol-4, ethylene glycol dibutyl ether, and 3-methyl 3-nonanol.

Data No.: B088-01
Fluids: WA, LB, MD
Category: Surface_tension
Temp.: 20～80℃
Conc.: 0.05,0.10 wt% (MD)
Memo1: MD:INHIBITOR

Data No.: B088-02
Fluids: WA, LB, DBEEG
Category: Surface_tension
Temp.: 20～80℃
Conc.: 0.05,0.10 wt% (DBEEG)
Memo1: DBEEG:INHIBITOR

Data No.: B088-03
Fluids: WA, LB, OC
Category: Surface_tension
Temp.: 20～80℃
Conc.: 0.05,0.10 wt% (OC)
Memo1: OC:INHIBITOR

Data No.: B088-04
Fluids: WA, LB, 2MN
Category: Surface_tension
Temp.: 20～80℃
Conc.: 0.05,0.10 wt% (2MN)
Memo1: 2MN:INHIBITOR

Data No.: B088-05
Fluids: WA, LB, 3MN

Category: Surface_tension
Temp.: 20～80℃
Conc.: 0.05,0.10 wt% (3MN)
Memo1: 3MN:INHIBITOR

Data No.: B088-06
Fluids: WA, LB, DO
Category: Surface_tension
Temp.: 20～80℃
Conc.: 0.05,0.10 wt% (DO)
Memo1: DO:INHIBITOR

Author(s): Jennings,B.H. Shannon,F.P.
Title: The thermodynamics of absorption refrigeration. Tables of properties of aqua-ammonia solutions.
Source: J.ASRE, p333-336, 1938 MAY.
Paper No.: A093 Language: English
Reviewer: Japan-J Doc.type: Journal

Data No.: A093-01
Fluids: AM, WA
Category: PVT-X

Author(s): Jensen,M.K.
Title: Enhancement of the critical heat flux in pool boiling of refrigerant-oil mixtures
Source: Trans. ASME., J. Heat Transfer (USA), vol.106, no.2, P.477-9, May 1984.
Paper No.: D075 Language: English
Reviewer: Japan-I Doc.type: Journal

Author(s): Kashiwagi,T. Kurosaki,Y. Shishido,H.
Title: オクタノールの添加による水溶液への蒸気吸収の促進効果－オクタノールの構造異性が吸収促進へ及ぼす影響
Title Eng: Absorption enhancement of water vapor in aqueous solution by addition of octanol: effect of isomerism of octanol.
Source: 日本冷凍協会学術講演会論文集; Proc. JAR Annual Conf., 1984, p33-36.
Paper No.: D245 Language: Japanese
Reviewer: Japan-J Doc.type: Conference
Comment: As results of experiment with absorption by adding surfactant 1-octanol, 2-octanol, 3-octanol to lithium bromide solution, and revealed that absorption acceleration is significant with 1-octanol, while it is small with the other octanols, and explained about the cause by a model with which drips of surfactant exist on the surface.

Data No.: D245-01
Fluids: WA, LB, OA1
Category: Absorber_(Absorption), Horizontal
Pressure: 2.38 kPa
Temp.: 293 K
Conc.: 50 mass% LiBr, 0.1 mass% 1-octanol

Author(s): Kashiwagi,T. Kurosaki,Y. Shishido,H.
Title: マランゴニ効果を利用した溶液中への蒸気吸収の促進　第一報，高級アルコールの添加による吸収促進効果とマランゴニ対流の発生機構
Title Eng: Enhancement of vapor absorption into a solution using the Marangoni effect. 1st report, mechanism for the inducement of the Marangoni convection and absorption enhancement.
Source: Japanese Society of Mechanical Engineering, Vol.51, No.463, p1002-09, March 1985.
Paper No.: B097 Language: Japanese
Reviewer: Japan-J Doc.type: Journal
Comment: (1) By making clear the relations between n-octanol concentration and absorption enhancement effect by Marangoni convection, proposed Marangoni convection generating mechanism. (2) Absorption was found to accelerate when n-octanol concentration fell within 0.01 and 2wt%, reaching a value four times as high as that reached when n-octanol is not added.

Data No.: B097-01
Fluids: WA, LB, OAl
Category: Surface_tension, Absorber_(Absorption)
Others
Temp.: Room temperature
Conc.: 50wt%(LiBr), 0～10wt%(Octanol)

Author(s): Kashiwagi,T. Watanabe,H. Omata,K.
Title: 流下するLiBr水溶液膜中への水蒸気吸収過程におけるマランゴニ効果(第一報　ダブルパルスルビーレーザによるマランゴニ対流の挙動の観察)
Title Eng: Marangoni effect on absorption of water vapor in falling aqueous lithium bromide solution. Part1: Observation of Marangoni convection by double-pulse ruby laser.
Source: 日本冷凍協会学術講演会論文集; Proc. JAR Annual Conf., 1987, p101-104.
Paper No.: D241 Language: Japanese
Reviewer: Japan-J Doc.type: Conference
Comment: Visualizes changes in liquid film thickness by means of a dispersive holography interference method with a double pulse ruby laser.

Data No.: D241-01
Fluids: WA, LB
Category: Absorber_(Absorption), Vertical
Flat_plate
Pressure: 3.3 kPa

Data No.: D241-02
Fluids: WA, LB, OAl
Category: Absorber_(Absorption), Vertical
Flat_plate
Pressure: 3.3 kPa
Conc.: 0.01 mass% OAl

Author(s): Kashiwagi,T. Okajima,J.
Title: アンモニア蒸気吸収過程におけるマランゴニ対流の発生
Title Eng: Onset of Marangoni convection in the process of absorption of ammonia vapor.
Source: 日本冷凍協会学術講演会論文集; Proc. JAR Annual Conf., 1987, p109-112.
Paper No.: D243 Language: Japanese

Reviewer: Japan-J Doc.type: Conference

Comment: Takes up n-octyl alcohol as a surfactant for NH3/H2O system and NH3/H2O-LiBr system, reveals that absorption accelerates significantly in the range of 0.06 to 1 mass%. Hydrocarbon surfactants were also examined and it was shown that n-heptyl alcohol is effective for the ternary system.

Data No.: D243-01
Fluids: AM, WA, OA1
Category: Absorber_(Absorption), Horizontal
Pressure: 0.2 MPa
Conc.: 0.02 - 3 mass% OA1

Data No.: D243-02
Fluids: AM, WA, LB, OA1
Category: Absorber_(Absorption), Horizontal
Pressure: 0.2 MPa
Conc.: 0.02 - 3 mass% OA1

Data No.: D243-03
Fluids: AM, WA, LB, HAL
Category: Absorber_(Absorption), Horizontal
Conc.: 0.1 mass% HAL

Author(s): Kashiwagi,T. Watanabe,H. Omata,K.
Title: 流下吸収溶液への相互不溶解性混合冷媒の吸収・凝縮複合熱伝達－ダブルパルスルビーレーザによる吸収・凝縮過程の可視化
Title Eng: Complex heat transfer of absorption and condensation of immiscible refrigerant mixtures to the flowing absorbent solution.
Source: 第25回日本伝熱シンポジウム講演論文集; Proc. 25th National Heat Transfer Symposium Japan, Vol.2, 1988, p451-453.
Paper No.: D228 Language: Japanese
Reviewer: Japan-J Doc.type: Conference

Data No.: D228-01
Fluids: , WA, LB, OA1
Category: Absorber_(Absorption), Vertical
Flat_plate
Temp.: 20, 50 C

Author(s): Kashiwagi,T. Watanabe,H. Omata,K.
Title: 流下するLiBr水溶液膜中への水蒸気吸収過程におけるマランゴニ効果（第二報　界面活性剤の添加量と吸収促進効果）
Title Eng: Marangoni effect on absorption of water vapor into falling aqueous LiBr solution. Part 2: addition of surfactant and absorption enhancement.
Source: 第22回空気調和・冷凍連合講演会講演論文集; Proc. 22th Air-Cond. Refrig. Conf. Japan, 1988, p65-68.
Paper No.: D230 Language: Japanese
Reviewer: Japan-J Doc.type: Conference
Comment: Experimentally makes it clear, in order to produce an absorption augmentation by Marangoni convection generated with the addition of surfactant, dips of surfactant must exist on the surface. In the experiment, attempts are made to visualize the effect through interfering strips using a double pulse laser.

Data No.: D230-01

Fluids: WA, LB
Category: Absorber_(Absorption), Vertical
Flat_plate
Pressure: 4.0 kPa
Memo1: theoretical mean liquid film thickness: 0.4172, 0.4507 mm

Data No.: D230-02
Fluids: WA, LB, OA1
Category: Absorber_(Absorption), Vertical
Flat_plate
Pressure: 4.0 kPa
Memo1: theoretical mean liquid film thickness: 0.3791, 0.4095 mm

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Author(s): Kaudinya,J.V. Kaushik,S.C.
Title: Experimental validation of theoretical studies on open and forced flow solar regenerator.
Source: Int. J. Sol. Energy (Switzerland), vol.4, no.1, P.13-23, 1986.
Paper No.: D077 Language: English
Reviewer: Denmark Doc.type: Journal
Comment: Open solar regenerator.

Data No.: D077-02
Fluids: WA, ZB
Category: Generator, Others
Pressure: Atmospheric pressure
Temp.: 35-70℃
Conc.: 35-40%

Data No.: D077-1
Fluids: WA, LB
Category: Generator, Others
Pressure: Atmospheric pressure
Temp.: 30-70 ℃
Conc.: 35-40%

Author(s): Kawamata,O. Otani,T.
Title: 吸収冷凍機の吸収器用高性能伝熱管の検討
Title Eng: High-performance heat transfer tubes for an absorber of absorption refrigerating machines.
Source: 第22回空気調和・冷凍連合講演会講演論文集; Proc. 22th Air-Cond. Refrig. Conf. Japan, 1988, p61-63.
Paper No.: D231 Language: Japanese
Reviewer: Japan-J Doc.type: Conference
Comment: Experimentally seeks a tube structure suitable for absorbers.

Data No.: D231-01
Fluids: WA, LB
Category: Absorber_(Absorption), Horizontal
Outside_of_tube
Temp.: 40 C
Conc.: 58 mass%

Data No.: D231-02
Fluids: WA, LB, OA1
Category: Absorber_(Absorption), Horizontal
Outside_of_tube
Temp.: 40 C
Conc.: 58 mass%

Author(s): Kimura,T. Tajima,O. Sakurasawa,J. Suehiro,T.
Title: リチウムブロマイド水溶液の低圧プール沸騰熱伝達について（第4報　水平円管２本の場合）
Title Eng: Pool boiling heat transfer of aqueous lithium bromide solution at low pressure. Part 4.
Source: 日本冷凍協会学術講演会論文集; Proc. JAR Annual Conf., 1976, p63-66.
Paper No.: D251 Language: Japanese
Reviewer: Japan-J Doc.type: Conference
Comment: Probes influences upon the heat transfer of upper heat transfer tubes exerted by heat fluxes of lower heat transfer tubes in pool boiling of lithium bromide solution.

Data No.: D251-01
Fluids: WA, LB
Category: Evaporator_(Evaporation)
Pressure: 35, 70, 150 mmHg
Temp.: saturated temperature
Conc.: 0, 30, 50 mass%

Author(s): Kiyota,M. Morioka,I. Doi,H.
Title: 水平冷却管上を流下する臭化リチウム水溶液への水蒸気の吸収
Title Eng: Absorption of water vapor into a LiBr solution film falling along a horizontal pipe.
Source: 第24回日本伝熱シンポジウム講演論文集; Proc. 24th National Heat Transfer Symposium of Japan, p182, 1987.
Paper No.: D206 Language: Japanese
Reviewer: Japan-J Doc.type: Conference
Comment: Conducts experiment and analysis for calculating the amount of steam absorbed when absorbent is flowing down along a horizontal smooth tube. The analysis employs a laminar flow model, without taking account of surface waves.

Data No.: D206-01
Fluids: WA, LB
Category: Absorber_(Absorption), Horizontal Outside_of_tube
Pressure: 6.5, 6, 5.5 torr
Temp.: 38.5 C
Conc.: 58.6 %

Author(s): Knaff,G. Schlunder,E.U.
Title: Competitive physical absorption of gases into water.
Source: Chem. Eng. & Process. (Switzerland), vol.19, no.4, P.191-8, July-Aug. 1985.
Paper No.: D086 Language: German
Reviewer: Denmark Doc.type: Journal
Comment: Absorption of gases in water. As gases have been used: O2, N2, He and Ne.

Data No.: D086-01
Fluids: WA
Category: Absorber_(Absorption), Others
Pressure: 99.9 kPa
Temp.: 20 ℃

Author(s): Kohno,K. Ouchi,T. Nishiguchi,A.
Yamaguchi,A.
Title: 臭化リチウム水溶液の水平管内沸騰熱伝達
Title Eng: Boiling heat transfer of lithium bromide-water solution in a horizontal tube.
Source: 空気調和・冷凍連合講演会20周年記念大会講演論文集; Proc. 20th Air-Cond. Refrig. Conf. Japan, 1986, p5-8.
Paper No.: D237 Language: Japanese
Reviewer: Japan-J Doc.type: Conference

Data No.: D237-01
Fluids: WA, LB
Category: Evaporator_(Evaporation), Horizontal
Inside_of_tube

Author(s): Kohno,K. Sugimoto,S. Oouchi,T.
Kurosawa,M. Kannow,S.
Title: 垂直管内吸収型吸収器の研究
Title Eng: A study of an absorber with vertical tubes.
Source: 第24回日本伝熱シンポジウム講演論文集; Proc. 24th National Heat Transfer Symposium of Japan, p495, 1987.
Paper No.: D202 Language: Japanese
Reviewer: Japan-D Doc.type: Conference
Comment: Proposes a performance evaluation method for air-cooled vertical intratube absorber.

Data No.: D202-01
Fluids: WA, LB
Category: Absorber_(Absorption), Vertical
Inside_of_tube
Memo1: 100<Re<600

Author(s): Kouremenos,D.A. Stegou-Sagia,A.
Title: Measuring the evaporation of NH3 in triple-fluid gas absorption units.
Source: Int. J. Refrig., Vol.11, 1988, p153-158.
Paper No.: D263 Language: English
Reviewer: Doc.type: Journal

Author(s): Kumar,P. Devotta,S. Holland,F.A.
Title: Experimental heat and mass transfer studies on the solar generator of an open cycle absorption cooler.
Source: Chem. Eng. Res. & Des. (GB), vol.63, no.3, P.139-48. May 1985.
Paper No.: D090 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: Experimented with performance of a solar powered regenerator used in an open cycle absorption refrigerating machine. By simulating the sun with CSI lamp or electric heater, lithium chloride solution is flowed down in a flat plate with a thin film, and heat and mass transfer coefficients are correlated in dimensionless forms.

Data No.: D090-01
Fluids: WA, LC
Category: Generator, Flat_plate
Pressure: Open to the air
Temp.: 25.5～28.5℃; 20～25℃(air)
Conc.: 31～34 wt%
Memo1: Heat flux: 0.5～1.0kW/m2; Relative humidity:30～50%

Author(s): Kunugi,Y. Usui,S. Ouchi,T.
Fukuda,T.
Title: 吸収式冷凍機用蒸発器の伝熱性能
Title Eng: Heat transfer performance of an evaporator for absorption refrigerating machines.
Source: 日本冷凍協会論文集; Trans. JAR, Vol.1, No.2, 1984, p21-27.
Paper No.: D226 Language: Japanese
Reviewer: Doc.type: Journal

Author(s): Kunugi,Y. Usui,S. Ouchi,T.
Fukuda,T.
Title: 温水熱源吸収式冷凍機用再生器の性能
Title Eng: Performance of a generator for absorption refrigerating machines powered by hot water.
Source: 日本冷凍協会論文集; Trans. JAR, Vol.1, No.2, 1984, p29-37.
Paper No.: D260 Language: Japanese
Reviewer: Doc.type: Journal

Author(s): Kunugi,Y. Usui,S. Ouchi,T.
Fukuda,T.
Title: 吸収冷凍機用吸収器の伝熱性能
Title Eng: Heat transfer performance of an absorber for absorption refrigerating machines.
Source: 日本冷凍協会論文集; Trans. JAR, Vol.2, No.3, 1985, p35-41.
Paper No.: D227 Language: Japanese
Reviewer: Doc.type: Journal

Author(s): Le Goff,H. Ramadane,A. Barkaoui,M.
Chen,Y. Le Goff,P.
Title: Modeling of coupled heat and mass transfer in a falling film: application to absorbers and desorbers in absorption heat pumps.
Source: Sci. Tech. Froid, 1985, no.3, P.155-63.
Paper No.: D091 Language: English
Reviewer: Belgium Doc.type: Journal

Author(s): Le Goff,H. Ramadane,A. Le Goff,P.
Title: Modeling of simultaneous heat and mass transfer in gas-liquid absorption in a falling film.
Source: Int. J. Heat & Mass Transfer (GB), vol.28, no.11, P.2005-17, Nov. 1985.
Paper No.: D093 Language: French
Reviewer: Belgium Doc.type: Journal

Author(s): Le Goff,H. Ramadane,A. Barkaoui,M.
Chen,Y. Le Goff,P.

Title: Modelisation of coupled heat and mass transfer in a falling film: application to absorbers and desorbers in absorption heat pumps.
Source: EUR-10007-EN, Comm. Eur. Communities, 1985, B13.
Corp_src: Comm. Eur. Communities.
Paper No.: D198 Language: English
Reviewer: Japan-I Doc.type: Report, Conference
Comment: Introduces several analysis models on simultaneous heat and mass transfer in the falling liquid film, showing representative examples of application of these models to water-LiBr system absorber or generator. (Each model is detailed by the author in different papers.)

Data No.: D198-01
Fluids: WA, LB
Category: Absorber_(Absorption)

Author(s): Le Goff,H. Ramadane,A. Le Goff,P.
Title: A simple model of the coupled penetration of heat and mass transfer for gas-liquid absorption in a laminar falling film.
Source: Int. J. Heat & Mass Transfer (GB), vol.29, no.4, P.625-34, April. 1986.
Paper No.: D092 Language: French
Reviewer: Belgium Doc.type: Journal

Author(s): Luk,S. Lee,Y.H.
Title: Mass transfer in eddies close to air-water interface.
Source: AIChE J. (USA), vol.32, no.9, P.1546-54, Sept. 1986.
Paper No.: D098 Language: English
Reviewer: Japan-I Doc.type: Journal
Comment: Theory concerning gas absorption involving no generation of heat. By using a single-eddy model, velocity fluctuations and concentration fluctuations were directly analyzed to obtain the size and speed of each eddy, and thereby evaluated the eddy exposure time and each eddy's involvement in mass transfer. In the experiment, airborne oxygen was absorbed by water, and subjected to measurement/analysis.

Data No.: D098-01
Fluids: NS
Category: Absorber_(Absorption)

Author(s): Mack,R.
Title: Stoff- und Wärmeübertragung bei Rücklaufkühlern für Absorptionswärmepumpen.
Title Eng: Mass and heat transfer in reflux condensers of absorption heat pumps.
Source: DFVLR-FB-83-43, July 1984, 42p.
Corp_src: Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt e.V., Hardthausen (Germany, F.R.). *National Aeronautics and Space Administration, Washington,DC.
Paper No.: D099 Language: German
Reviewer: Germany Doc.type: Report
Comment: An equation is presented to calculate horizontal reflux condensers in the rectification columns of the generator of an absorption heat pump.

Data No.: D099-01
Fluids: AM, WA
Category: Heat_pump, Generator
Horizontal

Author(s): Mashelkar,R.A. Soylu,M.
Title: Absorption in mixed surfactant-polymeric films: a novel phenomenon.
Source: AIChE J. (USA), vol.30, no.4, P.688-91, July 1984.
Paper No.: D102 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: In absorption of gas in the falling liquid film, when surface active agent is added, usually, convection is arrested, and mass transfer deteriorates. Meanwhile, when high polymer agent, which lowers viscosity, is added , the shearing force at the wall deteriorates, becoming a thinner film. This accelerates convection, leading to improved mass transfer. By performing experiment on mass transfer with addition of surface active agent and polymer agent, this paper shows that the mass transfer arresting effect of surface active agent is canceled by addition of polymer agent, though no reference is made to the reasons.

Data No.: D102-01
Fluids: CDO, WA
Category: Absorber_(Absorption)

Author(s): Matsuda,A. Shirabe,N. Takahasi,F. Munakata,T.
Title: 臭化リチウム水溶液による低圧水蒸気の吸収（一方拡散モデルによる解析）
Title Eng: Absorption of water vapor by lithium bromide solution at low pressure.
Source: 化学工学論文集; Dept.of Chem.Eng., Krushu University, Fukuoka 812, Kagaku Kogaku Ronbunshu, (612), p157-164. 1980.
Paper No.: B123 Language: Japanese
Reviewer: Japan-J Doc.type: Journal
Comment: By experimenting with absorption of steam into the falling liquid film of lithium bromide solution, analyzes the results of unidirectional diffusion model. Possible influences of surface active agent and shape of heat transfer tube have not been covered. Basic research.

Data No.: B123-01
Fluids: WA, LB
Category: Absorber_(Absorption), Vertical
Outside_of_tube
Pressure: 0.33～2.9kPa
Conc.: 45wt%LiBr

Author(s): Matsuda,A. Ide,T.
Title: 減圧下における臭化リチウム水溶液の流下液膜式蒸発器に及ぼす濃度の影響
Title Eng: Effect of concentration on evaporation rate for lithium bromide aqueous solution in a falling film heater.

Source: 日本冷凍協会論文集; Trans. JAR, Vol.5, No.1, 1988, p55-62.
Paper No.: D224   Language: Japanese
Reviewer: Doc.type: Journal

Author(s): Mazet,N. Payre,D. Mauran,S.
           Crozat Spinner,B.
Title: Thermochemical heat pumps using solid or saturated solution and gas: irreducible coupling between heat-mass diffusion and reaction.
Source: VDI Berichte, 1986, p.945-959.
Paper No.: E046   Language: French
Reviewer: Doc.type: Journal

Data No.: E046-01
Fluids: WA, CuS
Category: Solubility, Heat_pump

Data No.: E046-02
Fluids: AM, CC
Category: Solubility, Heat_pump

Data No.: E046-03
Fluids: MA, LC
Category: Solubility, Heat_pump

Author(s): McCready,M.J. Hanratty,T.J.
Title: Concentration fluctuations close to a gas-liquid interface.
Source: AIChE J. (USA), vol.30, no.5, P.816-17, Sept. 1984.
Paper No.: D103   Language: English
Reviewer: Japan-E Doc.type: Journal

Data No.: D103-01
Fluids: NS
Category: Absorber_(Absorption)

Author(s): McCready,M.J. Hanratty,T.J.
Title: Effect of air shear on gas absorption by a liquid film.
Source: AIChE J. (USA), vol.31, no.12, P.2066-74, Dec. 1985.
Paper No.: D104   Language: English
Reviewer: Japan-I Doc.type: Journal
Comment: Experiments with a rectangular channel in which oxygen is absorbed into a liquid film flew from a turbulent air flow. Mass transfer coefficient varies greatly depending upon the shearing force from the turbulent air flow. By measuring wave motions at the interface, discusses relations between wave motions and mass transfer coefficient. Deals with absorption involving no heat generation, differing from absorption in the case of ıbsorption heat pump.

Data No.: D104-01
Fluids: NS
Category: Absorber_(Absorption)

Author(s): Michel,J.W. Perez-Blanco,H.
Title: Influence of a Surfactant Additive on Absorption Heat Pump Performance.
Source: CONF-850606-11, 1985, 16p; ASHRAE semiannual meeting, Honolulu, 23 Jun 1985; NTIS, PC A02/MF A01
Corp_src: Oak Ridge National Lab., TN. *Department of Energy, Washington, DC.
Paper No.: D108 Language: English
Reviewer: USA Doc.type: Report,Conference
Comment: The authors recognize the lack of agreement countering the mechanism of enhancement of heat and mass transfer in H2O-LiBr absorbers by alcohol additives. However, their proposal to place additives in the generator of temperature boosting heat pumps, in order to extend its capasity, may be impractical due to the higher temperature of operation and presence of oxidizing corrosion inhibitors. Theoretical treatment is accurate for the case of pool-boiling generator types.

Author(s): Michel,J.W. Perez-Blanco,H.
Title: INFLUENCE OF A SURFACTANT ADDITIVE ON ABSORPTION HEAT PUMP PERFORMANCE.
Source: ASHRAE Trans., Vol.91, pt2B, (1985), 1847-1856.
Corp_src: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE)
Paper No.: D109 Language: English
Reviewer: Japan-J Doc.type: Report
Comment: Experimental research intended to increase the absorption heat pump capacity by adding surfactant to improve the boiling heat transfer in the generator. About 10.5% capacity increase has resulted when experimented with a type 2 heat pump by adding 100ppm of surfactant to lithium bromide-water system. Name of the surfactant used is unknown.

Data No.: D109-01
Fluids: WA, LB
Category: Generator

Author(s): Moellenbruck,W.
Title: Mathematical models for the boiling diagram of the ideal two-component mixture.
Source: DF-VLR-FB-84-22; Order no. DE85750262, 1984, 31p.
Corp_src: Dtsch. Forsch. - und Versuchsanst. luft- und Raumfahrt e.V.
Paper No.: D113 Language: German
Reviewer: Germany Doc.type: Report

Author(s): Morioka,I. Kiyota,M. Fukui,F.
Title: 過冷却臭化リチウム水溶液への水蒸気の吸収
Title Eng: Absorption of water vapor into subcooled LiBr solution.
Source: 第24回日本伝熱シンポジウム講演論文集; Proc. 24th National Heat Transfer Symposium of Japan, p179, 1987.
Paper No.: D207 Language: Japanese
Reviewer: Japan-J Doc.type: Conference

Author(s): Morioka,I. Kiyota,M.
Title: 垂直壁を流下する臭化リチウム水溶液膜への水蒸気の吸収実験
Title Eng: Absorption of water vapor into a lithium bromide water solution film falling along a vertical plate.
Source: 日本機械学会論文集; Trans. JSME, B, Vol.53, No.485, 1987, p236-240.
Paper No.: D258 Language: Japanese
Reviewer: Doc.type: Journal

Author(s): Muehlmann,H.P. Wessing, W.
Title: Der Verdampfer in einer Absorptionwärmepumpe.
Title Eng: Vaporizer in an absorption heat pump.
Source: DKV-Tagungsbericht, 1985, vol.12, P.473-88.
Corp_src: Deutscher Kälte- und Klimatechnischer Verein.
Paper No.: D121 Language: German
Reviewer: Germany Doc.type: Journal
Comment: Influence of the frost formation on the evaporator surface on the COP of a commercial absorption heat pump.

Data No.: D121-01
Fluids: AM, WA
Category: Evaporator_(Evaporation), Vertical
Outside_of_tube, Practical_machine

Author(s): Murray,P. Carey,G.F.
Title: Numerical computation of coupled viscous flow/transport problems: absorption of a gas by a moving fluid with reaction.
Source: Sixth International Symposium on Finite Element Methods in Flow Problems., P.459-63, 1986
Corp_src: Inst. Nat. Recherche Inf. & Autom.
Paper No.: D124 Language: English
Reviewer: USA Doc.type: Conference

Author(s): Nagaoka,Y. Nishiyama,N. Ajisaka,K.
Kawamata,O. Tadaki,T.
Title: 吸収冷凍機の吸収器用伝熱管の研究(第二報　各種伝熱管の吸収特性)
Title Eng: A study of heat transfer tubes for an absorber of the absorption refrigerator (2nd report: the absorption characteristics of various heat transfer tubes)
Source: 第24回日本伝熱シンポジウム講演論文集; Proc. 24th National Heat Transfer Symposium of Japan, p507, 1987.
Paper No.: D200 Language: Japanese
Reviewer: Japan-H Doc.type: Conference

Author(s): Nagaoka,Y. Nishiyama,N. Ajisaka,K.
Sawada,A. Tadaki,T.
Title: 吸収冷凍機の吸収器用伝熱管の研究(第一報　伝熱管の評価方法)
Title Eng: A study of heat transfer tubes for an absorption refrigerator (1st report: the evaluation for heat transfer tubes)
Source: 第24回日本伝熱シンポジウム講演論文集; Proc. 24th National Heat Transfer Symposium of Japan, p504, 1987.
Paper No.: D201 Language: Japanese
Reviewer: Japan-H Doc.type: Conference

Author(s): Nakao,K. Ozaki,E. Yamanaka,G.
Title: 吸収式ヒートポンプ用縦型熱交換器の研究
Title Eng: A study of vertical heat exchanger for absorption heat transformer (1st report: mass transfer characteristics in absorber)
Source: 第23回日本伝熱シンポジウム講演論文集; Proc. 23th National Heat Transfer Symposium of Japan, p637, 1986.
Paper No.: D204 Language: Japanese
Reviewer: Japan-E Doc.type: Conference

Data No.: D204-01
Fluids: WA, LB
Category: Absorber_(Absorption)
Pressure: 72.82kPa
Temp.: Inlet:364.15±2K (91± 2℃)
Conc.: Inlet:53～54wt%,58wt%
Memo1: Solution flow rate:44～150kg/h

Author(s): Niederkruger,M. Yuksel,M.L.
Title: Direct measurement of the surface tempterature of falling films.
Source: Chem. Eng. & Process. (Switzerland), vol.21, no.1, P.33-9 Jan. 1987.
Paper No.: D125 Language: English
Reviewer: Denmark Doc.type: Journal
Comment: Measurement of the surface temperature in film absorber.

Data No.: D125-01
Fluids: NS
Category: Absorber_(Absorption), Vertical Outside_of_tube

Author(s): Nishiguchi,A. Usui,S. Ouchi,T. Kohno,K.
Title: 吸収式冷凍機用発生器の伝熱性能
Title Eng: Heat transfer performance of a generator for absorption refrigerating machines.
Source: 第19回空気調和・冷凍連合講演会講演論文集; Proc. 19th Air-Cond. Refrig. Conf. Japan, 1985, p5-8.
Paper No.: D239 Language: Japanese
Reviewer: Doc.type: Conference

Author(s): Ogawa,K. Isshiki,N. Hosaka,H.
Title: 臭化リチウム水溶液の吸収熱伝達に関する研究
Title Eng: A study of absorption heat transfer in aqueous lithium bromide solution.
Source: 第21回空気調和・冷凍連合講演会講演論文集; Proc. 21th Air-Cond. Refrig. Conf. Japan, p93, 1987.
Paper No.: D212 Language: Japanese
Reviewer: Japan-E Doc.type: Conference
Comment: Experiments with heat transfer when steam is absorbed into the flowing lithium bromide solution through the liquid surface, and examines the effect of flow velocity and solution concentration upon the liquid surface temperature and quantity of heat absorbed. Also, it was observed by measuring the liquid surface temperature in the direction of the liquid surface depth that, as it goes downstream, the temperature boundary layer becomes thick.

Data No.: D212-01
Fluids: WA, LB
Category: Absorber_(Absorption)
Pressure: Atmospheric pressure
Temp.: 40, 80℃ (LiBr solution); 100℃(water)
Conc.: 0,20,40,60 wt% (LiBr)

Author(s): Oouchi,T.
Title: Study on absorption cooling -heating systems with air heat source-generators.
Source: Paper for 17th Conference of Japan Air Conditioning and Refrigeration. pp.144 Tokyo, 1983.
Paper No.: B144 Language: Japanese
Reviewer: Japan-D Doc.type: Conference proceedings

Data No.: B144-01
Fluids: R22, DMETEG
Category: Generator, Horizontal
Inside_of_tube
Temp.: temperature difference:10～80℃
Memo1: heat flux: 5～80kW/m^2

Data No.: B144-02
Fluids: WA
Category: Generator, Horizontal
Inside_of_tube
Memo1: NTU:3.71; temperature efficiency:0.97

Author(s): Ouchi,T. Kunugi,Y. Kohno,K.
Sugimoto,J. Kurosawa,M.
Title: 垂直管の管内吸収熱伝達
Title Eng: Absorption heat transfer in a vertical tube.
Source: 第21回空気調和・冷凍連合講演会講演論文集; Proc. 21th Air-Cond. Refrig. Conf. Japan, 1987, p105-108.
Paper No.: D234 Language: Japanese
Reviewer: Doc.type: Conference

Author(s): Ouchi,T. Kunugi,Y. Aizawa,M.
Sugimoto,J. Kurosawa,M.
Title: 空冷二重効用吸収冷温水機の開発（第二報 内面溝付き管使用の空冷吸収器の性能）
Title Eng: Development of an air-cooled double-effect absorption chiller heater. Part 2: Performance of the air-cooled absorber with inside-grooved tubes.
Source: 第22回空気調和・冷凍連合講演会講演論文集; Proc. 22th Air-Cond. Refrig. Conf. Japan, 1988, p57-61.
Paper No.: D232 Language: Japanese
Reviewer: Doc.type: Conference

Author(s): Ozono,T. Tsushima,T. Sakaide,K.
Okumura,T.
Title: 吸収式冷凍機の研究（第２報 トレー形吸収器の実験的研究）
Title Eng: A study of absorption refrigerator. 2nd report: experimental studies on a tray-type absorber.
Source: 神戸商船大学紀要 第二類; Bull. Kobe Univ. of Mercantile Marine, Vol.28, p.68, 1980.

Paper No.: D218 Language: Japanese
Reviewer: Japan-D Doc.type: Report
Comment: In order to realize air-cooled systemization of H2O/LiBr system, it is necessary to achieve isothermal absorption with voluminous absorbent, i.e. 20 to 30 times as much as usual volume. As a means for it, designed a tray-type absorber. Since there are small temperature and pressure differences, there is a large data dispersion. Now that the mass transfer coefficient has been calculated, it would be better to calculate a heat transfer coefficient.

Data No.: D218-01
Fluids: WA, LB
Category: Absorber_(Absorption), Others
Pressure: 5~30mmHg(in absorber)
Temp.: 40~60℃(absorbent solution)
Conc.: 55,60%(absorbent solution)
Memo1: Solution flow rate:500~2000kg/h.

Author(s): Paniev,G.A.
Title: Absorption heat and mass transfer on droplets in polydispersed spray.
Source: Heat Transfer - Sov. Res. (USA), vol.15, no.5, P.62-72, Sept.-Oct. 1983.
Paper No.: D131 Language: English
Reviewer: Japan-E Doc.type: Journal
Comment: The accuracy of the experiment is unknown. Pigeonholed the results of experiment based on the results of analysis of other papers on mass transfer/diffusion and heat transfer in the sprayed liquid drops, and derived the liquid drop surface-gas phase contacting time by coupling the experimental results with the analytical results. The accuracy of the time does not seem to be high enough.

Data No.: D131-01
Fluids: WA, LB
Category: Absorber_(Absorption), Vertical
Others
Pressure: 38.04GPa(?)
Temp.: 20~55℃
Conc.: 52~54%(LiBr)

Author(s): Pfluegl,M. Moser,F.
Title: BEHAVIOR OF ABSORBERS WITH FALLING FILMS OF SALT SOLUTIONS IN HEAT PUMP APPLICATIONS.
Source: 3rd International Symposium on the Large Scale Applications of Heat Pumps, Oxford, England:25-27 March 1987, Paper G1, p.141-148.
Paper No.: D135 Language: English
Reviewer: USA Doc.type: Report
Comment: A mathematical model describing falling film absorption is described. It is based on heat and mass conversion and a turbulence model. Good agreement was obtained between the model and experimentally obtained performance using H2O-LiBr. The general applicability to other working fluids and absorber designs is unknown.

Author(s): Prevost,M. Hour,M.H. Bugarel,R.
Title: New type of absorbers.
Source: EUR-10007-EN; Comm. Eur. Communities, (Rep.) EUR (1985); Absorpt. Heat Pumps Congr., P.94-107.
Corp_src: Comm. Eur. Communities
Paper No.: D139 Language: English
Reviewer: Japan-I Doc.type: Report; conference
Comment: Introduces a method for analyzing absorbers for absorption heat pumps, and by selecting three types of absorber, i.e. (1) tangential, (2) corrugated (3) jet absorber, from various types of literature, summarizes the results obtained by analyzing them in terms of transfer coefficient, etc. (For details, reference literature must be reviewed.)

Data No.: D139-01
Fluids: NS
Category: Absorber_(Absorption)

Author(s): Raina,G.K. Wanchoo,R.K. Grover,P.D.
Title: Direet contact heat transfer with phase change: motion of evaporating droplets.
Source: AIChE J. (USA), vol.30, no.5, P.835-7, Sept 1984.
Paper No.: D142 Language: English
Reviewer: Japan-J Doc.type: Journal
Comment: This paper reviews the speed at which liquid drops ascend in an evaporator in which two insoluble liquids directly contact each other. Intended not to analyze phenomena peculiar to an absorption heat pump, but to predict performance of an ordinary direct contact evaporator.

Author(s): Ramadane,A. Barkaaui,M. Le Goff,H. Joukowski, R. Le Goff, P.
Title: Enhancement of heat and mass transfer in falling film evaporators and absorbers by turbulence promoters.
Source: Proc. World Congress 3, Japan, Sep. 1986, P355.
Paper No.: D194 Language: English
Reviewer: Japan-J Doc.type: Conference
Comment: Shows the results of experiment of lithium bromide solution falling liquid film evaporator and absorber when turbulence accelerating elements are set over the surface of heat exchangers, and presents a model for predicting heat and mass transfer coefficients. Both experiment and theory are described conceptually, and unclear in some of the details.

Data No.: D194-01
Fluids: NS
Category: Absorber_(Absorption), Generator
Vertical

Author(s): Ravelet,Robert
Title: ABSORPTION CYCLES METHANOL-CHLORURE DE CALCIUM.
Title Eng: Absorption cycles using methanol-calcium chloride.
Source: EUR-10007-EN; Comm. Eur. Communities, (Rep.) EUR (1985); Absorpt. Heat Pumps Congr., P.239-49.
Corp_src: Comm. Eur. Communities
Paper No.: D143 Language: French

Reviewer: Japan-E Doc.type: Report; Conference

Data No.: D143-01
Fluids: MA1, CC
Category: Others
Temp.: MA1:-0.9~10℃; CC:29.9~39.1℃

Author(s): Reimann,R.C.
Title: ADVANCED ABSORPTION HEAT PUMP CYCLES.
Source: CONF-841232; DE86002984; Research and Devolopment on Heat Pumps for Space Conditioning Applications; Proceedings of the DOE/ORNL Heat Pump Conf., Aug 1985, pp. 259-261; NTIS, PC A12/MF A01; 1.
Corp_src: Oak Ridge National Laboratory, TN (USA) (4832000)
Paper No.: D145 Language: English
Reviewer: Japan-E Doc.type: Report Article; Conference
Comment: Aimed to develop a new-type direct fired absorption heat pump, seeks to find an optimum cycle and absorbent-refrigerant combination aided by a computer. As a result, it proposes a dual cycle capable of working even when outdoor temperature is below 0℃. Although various limiting conditions are taken into account when selecting the optimum cycle and combination, commercialization will be achieved by grasping the thermal characteristics through demonstration test, etc., determining the machine size, etc.

Data No.: D145-01
Fluids: WA, MA, LB
Category: Heat_pump

Author(s): Renker,M. Hensgens,M.
Title: Absorption heat pumps (AHP) for heating capacities ranging from 300- 3,000 kW.
Source: EUR-10007-EN; Comm. Eur. Communities, (Rep.) EUR (1985); Absorpt. Heat Pumps Congr., P.339-54.
Corp_src: Comm. Eur. Communities
Paper No.: D146 Language: English
Reviewer: Japan-E Doc.type: Report; Conference
Comment: Shows operating temperature conditions and actual application examples (building heating, district heating, etc.) of NH3-H2O system absorption heat pumps. Although these are general types of utilization, they will be useful when employing a heat pump system.

Data No.: D146-01
Fluids: AM, WA
Category: Heat_pump, COP

Author(s): Schlerkmann,H. Schmitt,G.
Title: Korrelationsbetrachtung zum Einfluß von Säureinhibitoren auf die Metallauflösungsgeschwindigkeit und die Kinetik der Wasserstoffabsorption.
Title Eng: Considerations on the correlations between inhibition of metal dissolution and hydrogen absorption in the use of acid inhibitors.
Source: Werkstoff & Korrosion (Germany), vol.36, no.5, P.216-18, May 1985.

Paper No.: D152 Language: German
Reviewer: Germany Doc.type: Journal
Comment: No direct relation to absorption working fluids. Evaluation of literature data on the impact of 53 quaterary ammonia salts, 13 aliphatic and aromatic aldehydes and 12 aliphatic and aromatic ketons on the inhibition of the rate of metal dissolution and the hydrogen permeation currents at steel in H2S free and H2S saturated 16% hydrochoric acid.

Author(s): Schulze,G. Schlunder,E.U.
Title: The effect of multicomponent diffusion on the mass transfer during absorption of single gas bubbles.
Source: Chem. Eng. & Process. (Switzerland), vol.19, no.5, P.257-65, Sept.-Oct. 1985.
Paper No.: D156 Language: English
Reviewer: Denmark Doc.type: Journal
Comment: Absorption in a single gas bubble.

Data No.: D156-01
Fluids: WA
Category: Absorber_(Absorption), Others

Author(s): Sekoguchi,K. Tanaka,O. Shindou,T.
Title: 吸収冷凍機における吸収器の性能算定法について
Title Eng: Calculation of performance of an absorber for absorption refrigerating machines.
Source: 日本機械学会講演論文集; Prep. JSME, No.788-1, p.124, 1978.
Paper No.: D214 Language: Japanese
Reviewer: Japan-E Doc.type: Conference

Data No.: D214-01
Fluids: WA, LB
Category: Absorber_(Absorption), Horizontal Outside_of_tube
Pressure: 6～17mmHg
Conc.: 50～60wt%

Author(s): Sotelo,J.L. Benitez,F.J. Cabrera,L.
Title: Liquid mass transfer in laminar flow in a column containing a string of spheres and cylinders.
Source: Can. J. Chem. Eng. (Canada), vol.64, no.2, P.233-6, April 1986.
Paper No.: D161 Language: English
Reviewer: Japan-E Doc.type: Journal
Comment: Experimented with characteristics of packed column type absorption. From the experiment with absorption of glycerin solution and carbon dioxide, this paper examines how frequently the surface is replaced by the inside flow while flowing down along the packed column, and the liquid surface is renewed. This type is presented against the packed column type in which balls and columns are combined. So, care must be exercised when applied to the other shape. The experimental accuracy is average. The surface renewal frequency has been introduced and derived by coupling the results with the experiment. Introducing only the surfaçe renewal frequency is looks unreasonable.

Data No.: D161-01
Fluids: CDO, GYL
Category: Absorber_(Absorption), Others
Pressure: 100kPa
Temp.: 20,30,40℃
Conc.: 25%,55%(concentration of GYL)
Memo1: Flow rate of GYL:2～16 l/h; flow rate of CDO:0.1 m3/h

Author(s): Soumerai,H.
Title: Thermodynamic generalizations of heat and fluid flow data-with and without phase changes.
Source: Int. Commun. Heat & Mass Transfer (GB), vol.12, no.1, P.101-7, Jan-Feb. 1985.
Paper No.: D162 Language: English
Reviewer: Japan-I Doc.type: Journal
Comment: (No direct relation to absorption) Tries to discuss possible generalization of heat transfer data based on the analogy rules.

Author(s): Spedding,P.L. Jones,M.T. Lightsey,G.R.
Title: Ammonia absorption into water in a packed tower. 2. Measurement of mass transfer coefficients.
Source: Chem. Eng. J. (Switzerland), vol.32, no.3, P.151-63, June 1986.
Paper No.: D163 Language: English
Reviewer: Denmark Doc.type: Journal
Comment: Mass transfer coefficient in packed tower.

Data No.: D163-01
Fluids: AM, WA
Category: Absorber_(Absorption), Others

Author(s): Uddholm,H. Setterwall,F.
Title: Model for dimensioning a folling film absorber in an absorption heat pump.
Source: Int. J. Refrig., Vol.11, 1988, p41-45.
Paper No.: E027 Language: English
Reviewer: Sweden Doc.type: Journal
Comment: Presentation of a calculation procedure, which shows that waves on falling films influence the heat transferred.

Data No.: E027-01
Fluids:
Category: Absorber_(Absorption), Vertical
Outside_of_tube
Memo1: Heat transfer at different wave frequencies.

Author(s): Urakawa,K. Morioka,I. Kiyota,M.
Title: 垂直壁を流下する臭化リチウム水溶液への水蒸気の吸収
Title Eng: Absorption of water vapor into Lithium Bromide-water solution film falling along a vertical plate.
Source: 日本機械学会論文集; Trans. JSME, B, Vol.52, p1766, 1986.
Paper No.: D205 Language: Japanese
Reviewer: Japan-I Doc.type: Journal

Author(s): Urakawa,K. Morioka,I. Kiyota,M.
Title: Absorption of water vapor into lithium bromide-water solution film falling along a vertical plate.
Source: Bull. JSME, Vol.29, No.258, 1986, p4218-4222.
Paper No.: D259 Language: English
Reviewer: Doc.type: Journal

Author(s): Wassenaar,R.H.
Title: Simulation of the film flow on a horizontal tube fed by falling droplets.
Source: Proc. Int. Cent. Heat Mass Transfer, vol.24, Heat Mass Transfer Refrig. Cryog., P.277-84, 1987.
Corp_src: Lab. Refrig., Delft Univ. Technology
Paper No.: D173 Language: English
Reviewer: Denmark Doc.type: Conference
Comment: Film flow without absorption has been studied.

Data No.: D173-01
Fluids: MA1, LB, ZB
Category: Absorber_(Absorption), Horizontal Outside_of_tube
Temp.: 30-60 ℃
Conc.: 0.29-0.36 mass fraction methanol
Memo1: mass flow rate: 3-9 g/s

Author(s): Wassenaar,R.H. Machielsen,C.H.M. Iedema,P.D.
Title: Coupled heat and mass transfer on horizontal tubes fed by falling droplets.
Source: Proc. Int. Cent. Heat Mass Transfer, 1987, vol.24, Heat Mass Transfer Refrig. Cryog., P.271-6.
Paper No.: D174 Language: English
Reviewer: Denmark Doc.type: Journal

Data No.: D174-01
Fluids: MA1, LB, ZB
Category: Absorber_(Absorption), Horizontal Outside_of_tube
Pressure: 0.8-8.1 kPa
Temp.: 30-60 ℃
Conc.: 0.29-0.35 mass fraction methanol
Memo1: mass flow rate: 2.5-9.2 g/s

Author(s): Watanabe,O. Tajima,O.
Title: リチウムブロマイド・エチレングリコール水溶液の低圧力下における沸騰熱伝達
Title Eng: Boiling heat transfer of lithium bromide-ethylene glycol-water solution at low pressure.
Source: 空気調和・冷凍連合講演会20周年記念大会講演論文集; Proc. 20th Air-Cond. Refrig. Japan, 1986, p9-12.
Paper No.: D236 Language: Japanese
Reviewer: Doc.type: Conference

Author(s): Wilkinson,William H.
Title: Countercurrent flow absorber and desorber.
Source: Patent No.4477396 (USA), Oct. 1984
Corp_src: Battelle Development Corp.

Paper No.: D177 Language: English
Reviewer: USA Doc.type: Patent
Comment: In this patent several novel designs are presented to enhance the performance of absorption/desorption processes. Enhancement is due to use of extended surfaces in a falling film absorber/desorber to increase solution resistance time and surface area for better mass transfer. Heat transfer between the solution and heat transfer fluid is accomplished in a countercurrent manner to enhance system performance. Degree of enhancement due to novel designs is not quantified.

Author(s): Witte,I. Kind,R.
Title: Modelling of absorption of sulphur dioxide with aqueous sodium carbonate.
Source: Chem. Eng. & Process. (Switzerland), vol.20, no.4, P.183-90, July-Aug. 1986.
Paper No.: D178 Language: English
Reviewer: Denmark Doc.type: Journal
Comment: Purification of air from gaseous substances. (SO2)

Data No.: D178-01
Fluids: NS
Category: Absorber_(Absorption), Outside_of_tube

Author(s): Yeung,P.O.-Y Chapman,T.W.
Title: Design calculations for countercurrent gas-liquid reactors.
Source: Comput. & Chem. Eng. (GB), vol.10, no.3, P.259-67, 1986.
Paper No.: D179 Language: English
Reviewer: Japan-E Doc.type: Journal
Comment: Describes a design model of wet wall type absorbing unit in which gas and liquid flow countercurrently, and gas is absorbed into the liquid, while reacting in the liquid. The model includes flow, mass transfer and reaction in the gas phase, liquid film and liquid phase. Since the equation involves nonlinearity, it was converted to a Lobatto polynomial expression by 7-point orthogonal collocation in making calculation. Examines changes in outlet gas concentration by using mass transfer velocity, reaction velocity to mass transfer velocity ratio and absorption coefficient as parameters.

Data No.: D179-01
Fluids: NS
Category: Absorber_(Absorption)

Author(s): Yoshitomi,H. Tajima,O. Takeuchi,T. Hara,Y.
Title: 臭化リチウム水溶液の沸騰熱伝達について（第3報　液位の影響）
Title Eng: Boiling heat transfer of aqueous lithium bromide solution. Part 3: effect of liquid level.
Source: 日本冷凍協会学術講演会論文集; Proc. JAR Annual Conf., 1975, p59-62.
Paper No.: D252 Language: Japanese
Reviewer: Doc.type: Conference

Author(s): Zawacki,T.S. Macriss,R.A. Rush,W.F.
Title: The effect of additives on the level of instability of gas/liquid interfaces: the absorption of water vapor by concentrated lithium bromide solutions in falling-film and open-channel absorbers,
Source: Paper presented at the 75th National Meeting of the American Institute of Chemical Engineers, Detroit. June 3-6, 1973,
Paper No.: A237 Language: English
Reviewer: Japan-A Doc.type: Conference proceedings
Comment: Experimentally revealed the effects of surfactant upon steam absorbing phenomenon of LiBr solution in thin- film type and open-channel type absorbers. (1) In the case of the thin-film type, when surfactant is added, a boundary layer occurs in the vicinity of interface. (2) In the case of the open-channel type, absorbability improves due to violent interface agitation after addition of surfactant.

Data No.: A237-01
Fluids: WA, LB
Category: Diffusion_coefficient, Absorber_(Absorption)
Horizontal
Pressure: 33.33kPa
Temp.: 105℃
Conc.: 57～59 wt%

Author(s): Zawacki,T.S. Leipziger,S. Weil,S.A.
Title: Inducement of convective motion in static absorbers,
Source: Paper presented at 4th Joint Chemical Engineering Conference, American Institute Of Chemical Engineers/Canadian Society of Chemical Engineers, Vancouver, B.C., September 9-12, 1973.
Paper No.: A238 Language: English
Reviewer: Japan-A Doc.type: Conference proceedings
Comment: Steam absorbability of LiBr solution improves significantly when alcoholic additive of carbon number 6 to 8 causes interface agitation. Proposes three types of model for explaining the interface agitation phenomenon. Very informative literature on evaluation of additives.

Data No.: A238-01
Fluids: WA, LB
Category: Diffusion_coefficient, Absorber_(Absorption)
Others
Pressure: 1333.2Pa～2666.4Pa
Conc.: 57wt%
Memo1: surfactant:100ppm

Author(s): van der Wekken,B.J.C Wassenaar,R.H.
Title: Simultaneous heat and mass transfer accompanying absorption in laminar flow over a cooled wall.
Source: Int. J. Refrig., Vol.11, 1988, p70-77.
Paper No.: D265 Language: English
Reviewer: Doc.type: Journal

1.4.3 References on Absorption Cycles

1.4.3 References on Absorption Cycles

Author(s): Agarwal,R.S. Agarwal,A.K. Bin Gadhi,S.M.
Title: Performance analysis of R22 DMF turbo abosorption refrigeration system.
Source: Energy Convers. & Manage. (GB), vol.27, no.2, P.211-17, 1987.
Paper No.: D001 Language: English
Reviewer: Japan-B Doc.type: Journal
Comment: (1) A cycle featuring an improved COP by combining a vapor driven turbo refrigerating machine and an absorption refrigerating machine that utilizes waste vapor from the former. (2) Can be approaching to the COP of Carnot cycle. (3) The lower the temperature of waste vapor from the turbo refrigerating machine, the higher the COP. R22-DMF system.

Data No.: D001-01
Fluids: R22, DMF
Category: Refrigerating_machine, COP

Author(s): Alefeld,G.
Title: Regeln fur den Entwurf von mehrstufigen Absobenmachinen.
Source: Brennst.-Warme-Kraft, Vol.34(2), 1982, p.64-73.
Paper No.: E037 Language:
Reviewer: Belgium Doc.type: Journal
Comment: No data is reported, only theoretical cycles are discussed in the paper.

Data No.: E037-01
Fluids: NS
Category:

Author(s): Alefeld,G. Ziegler,F.
Title: ADVANCED HEAT PUMP AND AIR-CONDITIONING CYCLES FOR THE WORKING PAIR H2O/LIBR: DOMESTIC AND COMMERCIAL APPLICATIONS.
Source: ASHRAE Trans., Vol.91, pt2B, (1985), 2062-71.
Corp_src: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE)
Paper No.: D002 Language: English
Reviewer: Japan-H Doc.type: Report
Comment: Describes the integration of a steam compressor into a H2O/LiBr absorption system. By incorporating a compressor into an absorption cycle, the COP improves significantly - i.e. about 1.5 can be expected. Forming part of research on new-type cycles, it deserves examination.

Data No.: D002-01
Fluids: WA, LB
Category: Heat_pump, Refrigerating_machine
COP

Author(s): Alefeld,G. Ziegler,F.
Title: ADVANCED HEAT PUMP AND AIR-CONDITIONING CYCLES FOR THE WORKING PAIR H2O/LIBR: INDUSTRIAL APPLICATIONS.
Source: ASHRAE Trans., Vol.91, pt2B, (1985), 2072-2080.
Corp_src: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE)
Paper No.: D003 Language: English
Reviewer: Japan-H Doc.type: Journal
Comment: Concerning the working fluid H2O/LiBr, this paper proposes three types of cycle formed by combining the strong points of both absorption heat pump and heat transformer, and recommends that these cycles be applied to processes, such as distillation, evaporation and drying, and also used for supplementing or replacing conventional mechanical vapor compression. It seems that accuracy of performance value estimation is very high .

Data No.: D003-01
Fluids: WA, LB
Category: Heat_pump, COP

Author(s): Allen,R.A. Murphy,K.P.
Title: Development of a residential sized gas fired absorption heat pump.
Source: Annual Report for 1987, GRI-7910038, April 1980
Paper No.: A007 Language: English
Reviewer: Japan-B Doc.type: Report
Comment: (1) Performance analysis and evaluation with an experimental machine. (2) In order to improve an absorption heat pump using the organic working fluid R133a/ETFE, performance of its generator (including rectifier), absorber heat exchanger must be improved. (3) Thermodynamic characteristics of the working fluid are given in Sec. 10 (p.52~61), and transport/physical properties in Sec. 11 (p.62~76). (4) In R&D made after this report, refrigerant was changed from R133a to R123a (while hardware remains unchanged).

Author(s): Aly,S.E. Fathalah,K.A.
Title: Combined absorption-desciccant solar powered air conditioning system.
Source: W{rme- und Stoff}bertragung, 23, 1988, p111-121.
Paper No.: D262 Language: English
Reviewer: Doc.type: Journal

Author(s): Ansari,M. Ioannidis,G.
Title: Absorptionsvärmepump i Åkeshovsbadet.
Title Eng: Absorption heat pump at Akeshov swimming plant.
Source: Drift report No.8, 1985.
Corp_src: Statens Vattenfall.
Paper No.: E019 Language: Swedish
Reviewer: Sweden Doc.type: Report
Comment: Evaluation of an AHP in a public bath type Yazaki WFC 1500S. Waste energy from the evacuated air. Drive energy is heat water from the central boiler plant. Comparison

with a compressor heat pump. Heat load 40kW.

Data No.: E019-01
Fluids: WA, LB
Category: COP

Author(s): Aronson,D.
Title: Absorption refrigeration system.
Source: U.S.Patent., Vol.3, 478,530, 1969, November 18.
Paper No.: A014 Language: English
Reviewer: Japan-C Doc.type: Patent
Comment: (1) Compound absorbent of Li and Zn halogenate changes widely in physical properties depending on composition. (2) Data on boiling point shown in Fig. 6 seem to be somewhat inferior in accuracy.

Data No.: A014-01
Fluids: WA, LB
Category: PVT-X, Crystallization
Temp.: boiling point: 149~ 193℃, crystallization: 4~ 138℃

Data No.: A014-02
Fluids: WA, LB, ZB
Category: PVT-X, Crystallization
Temp.: boiling point: 210~ 266℃, crystallization:10~ 138℃

Data No.: A014-03
Fluids: WA, LB, ZC
Category: PVT-X, Crystallization
Temp.: boiling point: 210~ 238℃, crystallization:21~77℃

Data No.: A014-04
Fluids: WA, LC, ZB
Category: PVT-X, Crystallization
Temp.: boiling point: 202~ 221℃, crystallization:21~66℃

Data No.: A014-05
Fluids: WA, LC, ZC
Category: PVT-X, Crystallization
Temp.: boiling point: 210℃, crystallization:32℃

Data No.: A014-06
Fluids: WA, ZB
Category: PVT-X, Crystallization
Temp.: boiling point: 154℃, crystallization:20℃

Data No.: A014-07
Fluids: WA, LB, ZB, CB
Category: PVT-X, Crystallization
Temp.: boiling point: 221~ 249℃, crystallization:21~77℃

Data No.: A014-08
Fluids: WA, LB, LI, EG
Category: PVT-X, Crystallization
Temp.: boiling point: 193~ 216℃, crystallization:49~60℃

Author(s): Ball,D.A. Hanna,W.T.
Title: Development of the Battelle Absorption Heat Pump for Residential Application. Phase 1. Final Report.
Source: GRI-85/0277, 1985, 60p; NTIS, PC A04/MF A01
Corp_src: Battlelle Columbus Labs., OH.*Gas Reserch Inst. Chicago, IL.
Paper No.: D004 Language: English
Reviewer: Japan-G Doc.type: Report
Comment: An absorption heat pump developed by Battelle employs a two-stage absorption cycle. In phase 1, a testing device was prepared, subjected three systems - LiBr, NH3 and LiBr+NH3 - to cycle test, achieved the target COP values of 0.94 in the cooling mode and 1.80 in the heating mode, and made commercialization realizable.

Data No.: D004-01
Fluids: R22, DMF
Category: PVT-X
Temp.: 20~ 100℃
Conc.: 0.2~0.9 mol%

Data No.: D004-02
Fluids: AM, WA, LB
Category: PVT-X, Heat_pump
COP, Absorber_(Absorption)

Author(s): Ball,D.A. Hanna,W.T. Wilkinson,W.H. Maret,A.R.
Title: PROSPECTS FOR ADVANCED ABSORPTION RESIDENTIAL GAS-FIRED HEAT PUMP TECHNOLOGY.
Source: Energy Technol. (Wash., D.C.) (Aug 1985) vol.12, p.458-467; Conference: 12. annual energy technology conference and exposition, Washington, DC, USA, 25 March 1985.
Paper No.: D005 Language: English
Reviewer: USA Doc.type: Journal; Conference
Comment: Historical prospect of absorption heat pumps (AHP) developments. Way to improve performance of single-effect AHP's. Description of the Battelle heat pump's 3 operating modes (A/C, warm ambient heat pumping-WAHP, cold ambient heat pumping-CAHP). Dual-loop design with H2O-LiBr as the high temperature and NH3-H2O as the low temperature systems. Projected performance: 1.80 at 8.3℃ and 1.39 at -8.3℃. All COPs assume 90% burner efficiency.

Author(s): Berghmans,J.
Title: Development of an Absorption Heat Pump for Industrial Application.
Source: EUR-10432-EN (1986), 82p.
Corp_src: Commission of the European Communities, Luxemburg.
Paper No.: D007 Language: English
Reviewer: Belgium Doc.type: Report

Data No.: D007-01
Fluids: TFE, QUN
Category: Heat_pump, COP
Temp.: condensation: 140 C, evaporation: 110 C, generator: 200 C.

Author(s): Best,R. Eisa,M.A.R. Holland,F.A.
Title: Thermodynamic design data for absorption heat pump systems

operating on ammonia-water - part3. Simultaneous cooling and heating.
Source: Heat Recovery Syst. CHP, 1987, Vol.7, No.2, P.187-94.
Paper No.: D008 Language: English
Reviewer: USA Doc.type: Journal
Comment: Similar idealized parametric study as for cooling (D010).

Author(s): Best,R. Eisa,M.A.R. Holland,F.A.
Title: Thermodynamic design data for absorption heat pump systems operating on ammonia-water - part2. Heating.
Source: Heat Recovery Syst. CHP, 1987, Vol.7, No.2, P.177-85.
Paper No.: D009 Language: English
Reviewer: USA Doc.type: Journal
Comment: Similar idealized parametric study as for cooling (see D010).

Author(s): Best,R. Eisa,M.A.R. Holland,F.A.
Title: Thermodynamic design data for absorption heat pump systems operating on ammonia-water - part1. Cooling.
Source: Heat Recovery Syst. CHP, 1987, vol.7, no.2, P.167-75.
Paper No.: D010 Language: English
Reviewer: USA Doc.type: Journal
Comment: This paper presents a parametric analysis of an absorption cooler (heat driven) using the NH3-H2O working fluids. The treatment is conventional and the output is the ideal coefficient of performance and other cycle parameters. Tables have been prepared for possible combinations of operating temperatures and concentrations and graphs that show the interaction of operating temperatures.

Author(s): Bjurstörm,H. Raldow,W.
Title: Uppvärmning, kylning och energilagring mha absorptionsprocessen.
Title Eng: Heating, cooling and energy stocking in connection with the absorption process.
Source: STU-information, nr.200-1980.
Corp_src: Liber Tryck Stockholm.
Paper No.: E003 Language: Swedish
Reviewer: Sweden Doc.type:
Comment: Historical review and descriptions of systems. An introduction to the field of absorption heat technique.

Author(s): Blomqvist,L. Schmeling,P.
Title: Absorptionsvärmepump för bostadsuppvärmning - demonstrationsanläggning i Stjärnhovs Säteri.
Title Eng: Absorption heat pump for domestic heating - demonstration plant at Stjarnhov's farm.
Source: Studsvik - Technical Report, No.Ei-84/4., 1984.
Corp_src: Studsvik Energi Teknik AB, S-61182, Nyköping.
Paper No.: E020 Language: Swedish
Reviewer: Sweden Doc.type: Report
Comment: A small AHP is installed in a farm. Drive energy from a chip fired boiler and waste energy from lake water.

Data No.: E020-01
Fluids: AM, WA
Category: COP

Author(s): Bokelmann,H. Steimle,F.
Title: Development of advanced heat transformers utilizing new working fluids.
Source: Int. J. Refrig., 1986, vol.9, no.1, P.51-9.
Paper No.: D013 Language: English
Reviewer: Japan-G Doc.type: Journal
Comment: TFE-NMP and TFE-Pyr are specially promising. These new working fluids were compared to LiBr-H2O in respect of output temperature. As a heat recovery system, the paper presents two energy-saving hypothetical cycles. The new heat recovery system remains at R&D stage, and under the project GEA, new working fluids will be used at a test plant.

Data No.: D013-01
Fluids: NMP, TFE
Category: PVT-X, Enthalpy
Specific_heat, Corrosiveness
Pressure: 1～1000mbar
Temp.: -20～ 200℃
Conc.: 0～1.0

Data No.: D013-02
Fluids: TFE, Pyr
Category: PVT-X, Enthalpy
Specific_heat, Corrosiveness
Pressure: 1～1000mbar
Temp.: -20～ 200℃
Conc.: 0～1.0

Author(s): Chaudhari,S.K. Paranjape,D.V. Eisa,M.A.R. Holland,F.A.
Title: A study of the operating characteristics of a water-lithium bromide absorption heat pump.
Source: J. Heat Recovery Syst., 1985, vol.5, no.4, P.285-97.
Paper No.: D023 Language: English
Reviewer: Japan-D Doc.type: Journal
Comment: (1) The test rig is made of glass. (The device is informative.) (2) Output temperature : 70℃ (3) Explains about the absorption system, contrasting it to the vapor compression heat pump. (4) Describes the system as a negative deviation from Raoult's law.

Data No.: D023-01
Fluids: WA, LB
Category: Heat_pump, COP
Conc.: 46,53,57%
Memo1: Flow rate ratio:10～45

Author(s): Chaudhari,S.K. Paranjape,D.V. Eisa,M.A.R. Holland,F.A.
Title: A comparative study of the operating characteristics of water-lithium chloride and water-calcium chloride absorption heat pump.
Source: J. Heat Recovery Syst. 1986, Vol.6, No.1, P.39-46.
Paper No.: D022 Language: English

Reviewer: Japan-D Doc.type: Journal
Comment: (1) This fluid study is aimed to achieve the highest performance at the minimum cost. (2) Criteria for selecting working fluids are large negative deviation from Raoult's law, low vapor pressure, appropriate heat of mixing, solubility over a wide range. Led to improved LiBr prices, corrosiveness and reduced danger to health. (3) Uses a device made of glass. No comparison made with H2O/LiBr system.

Data No.: D022-01
Fluids: WA, LC
Category: Heat_pump, COP
Temp.: Condenser & absorber: 70℃
Conc.: Absorber: 43.8~43.5%
Memo1: Flow rate ratio:10~30

Data No.: D022-02
Fluids: WA, CC
Category: Heat_pump, COP
Temp.: Condenser & absorber: 70℃
Conc.: Absorber: 42.5~41.7%
Memo1: Flow rate ratio:10~30

Data No.: D022-03
Fluids: WA, LC, CC
Category: Heat_pump, COP
Temp.: Condenser & absorber: 70℃
Conc.: Absorber: 44.0~42.8%; LC:CC=1:1
Memo1: Flow rate ratio:10~30

Author(s): Cheron,J. Rojey,A.
Title: High-performance cycles with auxiliary fluid.
Source: EUR-10007-EN; Comm. Eur. Communities, (Rep.) EUR (1985); Absorpt. Heat Pumps Congr., P.175-88.
Corp_src: Comm. Eur. Communities
Paper No.: D025 Language: English
Reviewer: Japan-D Doc.type: Report; Conference
Comment: (1) COP increases when using two absorbers with hydrocarbon as an auxiliary fluid. (2) Its effect is such that it leads to an increased evaporation temperature difference. (3) The key to such effect lies in an auxiliary fluid cycle and evaporator-absorber-separator-evaporator loop.

Data No.: D025-01
Fluids: AM, WA
Category: COP
Temp.: Absorber: 20~80℃; temp. difference in evaporator:0~40℃

Author(s): Cheron,J. Rojey,A.
Title: High performance absorption heat pump with auxiliary fluid.
Source: Int. Workshop on Research Activities on Advanced Heat Pumps, 1986, p.235-250, Graz, Austria.
Paper No.: E034 Language: English
Reviewer: Belgium Doc.type: Conference proceedings

Data No.: E034-01
Fluids: AM, WA

Category: Heat_pump, COP
Operation_or_control
Temp.: water inlet at evaporator: 45 C, water outlet at condenser : 76 C.

Data No.: E034-02
Fluids: AM, WA
Category: Heat_pump, COP
Temp.: air inlet at evaporator: 5 C, water outlet at condenser: 5 0 C.

Author(s): Crozat,G. Mauran,S. Bodiot,D. Spinner,B. Burgarel,R.
Title: Etude de Faisabilité de pompe à Chaleurs Chimiques Utilisant des Systèmes Gas-Solide et Gax-Suspension Applicables au Chauffage de L'Habitat.
Title Eng: Feasibility study of chemical heat pumps using gas-solid and gas-suspension systems applicable for building heating.
Source: J. Entropie, (110), 1983, p.31-41.
Paper No.: E044 Language: French
Reviewer: Belgium Doc.type: Journal

Data No.: E044-01
Fluids: MA, ZC
Category: Solubility, Heat_pump

Data No.: E044-02
Fluids: MA, CC
Category: Solubility, Heat_pump

Data No.: E044-03
Fluids: MA, MnC
Category: Solubility, Heat_pump

Data No.: E044-04
Fluids: MA, CoC
Category: Solubility, Heat_pump

Data No.: E044-05
Fluids: MA, NiC
Category: Solubility, Heat_pump

Data No.: E044-06
Fluids: AM, CC
Category: Solubility, Heat_pump

Data No.: E044-07
Fluids: AM, BaC, n-HA
Category: Solubility, Heat_pump

Author(s): Dietrich,E. Le Goff,P. Barkaoui,M.
Title: Valeur Maximale du Coefficient de Performance d'Une Pompe à Chaleur à Absorption.
Title Eng: Maximum value of the coefficient of performance of an absorption heat pump.
Source: Entropie (France), vol.20, no.118, P.8-23, 1984.
Paper No.: D028 Language: French
Reviewer: Belgium Doc.type: Journal

Data No.: D028-01
Fluids: WA, LB
Category: Heat_pump, COP
Temp.: evaporation: 25 C and 5 C, condensation: 30 to 100 C.

Data No.: D028-02
Fluids: AM, WA
Category: Heat_pump, COP
Temp.: evaporation: 5 C and 25 C, condensation: 30 to 100 C.

Data No.: D028-03
Fluids: R22, DMETEG
Category: Heat_pump, COP
Temp.: evaporation: 5 C and 25 C, condensation: 30 to 100 C.

Data No.: D028-04
Fluids: R133a, NMP
Category: Heat_pump, COP
Temp.: evaporation: 5 C and 25 C, condensation: 30 to 100 C.

Author(s): Dietrich,E. Le Goff,H. Barkaoui,M.
Ramadane,A. Trap,J.C.
Title: A new technology for a multi-stage absorption heat pump, with internal energy storage.
Source: Rev. Gen. Therm., 1985, vol.24, no.281, P.537-45.
Paper No.: D030 Language: French
Reviewer: Belgium Doc.type: Journal

Author(s): Eisa,M.A. Chaudhari,S.K. Paranjape,D.V.
Holland,F.A.
Title: Classified references for absorption heat pump systems from 1975 to May 1985.
Source: . Heat Recovery Syst., 1986, Vol.6, No.1, P.47-61.
Paper No.: D033 Language: English
Reviewer: Japan-D Doc.type: Journal

Author(s): Eisa,M.A.R. Devotta,S. Holland,F.A.
Title: A study of economiser performance in a water-lithium bromide absorption cooler.
Source: Int. J. Heat & Mass Transfer (GB), vol.28, no.12, P.2323-9, Dec. 1985.
Paper No.: D041 Language: English
Reviewer: Japan-G Doc.type: Journal

Data No.: D041-01
Fluids: NS
Category: Heat_exchanger

Author(s): Eisa,M.A.R. Best,R. Holland,F.A.
Title: Thermodynamic design data for absorption heat transformers-part 1. Operating on water-lithium bromide.
Source: J. Heat Recovery Syst. 1986, Vol.6, No.5, P.421-32.
Paper No.: D034 Language: English
Reviewer: Japan-G Doc.type: Journal

Data No.: D034-01
Fluids: WA, LB
Category: COP

Author(s): Eisa,M.A.R. Best,R. Holland,F.A.
Title: Thermodynamic design data for absorption heat transformers. Part2. Operating on water-calcium chloride.
Source: J. Heat Recovery Syst., 1986, Vol.6, No.6, P.443-50.
Paper No.: D035 Language: English
Reviewer: Japan-G Doc.type: Journal

Data No.: D035-01
Fluids: WA, CC
Category: COP

Author(s): Eisa,M.A.R. Devotta,S. Holland,F.A.
Title: Thermodynamic design data for absorption heat pump systems operating on water-lithium bromide. 1. Cooling.
Source: Appl. Energy (GB), vol.24, no.4, P.287-301, 1986.
Paper No.: D037 Language: English
Reviewer: Japan-G Doc.type: Journal
Comment: Examines correlations with solution concentration, flow ratio and COP by changing temperatures of evaporator, absorber, condenser and generator. This paper presents data on refrigerating systems, and gives no descroption of the working fluid and physical properties.

Data No.: D037-01
Fluids: WA, LB
Category: Heat_pump, Practical_machine

Author(s): Eisa,M.A.R. Rashed,I.G.A. Devotta,S. Holland,F.A.
Title: Thermodynamic design data for absorption heat pump systems operating on water-lithium brimide. 2. Heating.
Source: Appl. Energy (GB), vol.25, no.1, P.71-82, 1986.
Paper No.: D038 Language: English
Reviewer: Japan-G Doc.type: Journal

Author(s): Eisa,M.A.R. Devotta,S. Holland,F.A.
Title: Thermodynamic design data for absorption heat pump systems operating on water-lithium bromide. 3. Simultaneous cooling and heating.
Source: Appl. Energy (GB), vol.25, no.2, P.83-96, 1986.
Paper No.: D039 Language: English
Reviewer: Japan-G Doc.type: Journal

Author(s): Eisa,M.A.R. Best,R. Holland,F.A.
Title: Thermodynamic design data for absorption heat-pump systems operating on water-calcium chloride.
Source: Appl. Energy (GB), vol.28, no.1, P69-81, 1987.
Paper No.: D040 Language: English
Reviewer: Japan-G Doc.type: Journal

Data No.: D040-01
Fluids: WA, CC
Category: PVT-X, Enthalpy
Heat_pump, COP
Temp.: 40~ 105℃
Conc.: 41.9~56.7%

Author(s): Ellington,R.D. Kunst,G. Peck,R.E.
Reed,J.F.
Title: The absorption cooling process.
Source: Inst. gas technol., Chicago, Res.Bull., No.14, 1957.
Paper No.: A057 Language: English
Reviewer: Japan-H Doc.type: Report
Comment: This paper reports on methods for evaluating refrigerant and absorbent combinations used in absorption refrigeration cycles. It also surveys evaluation reports on working fluids which are currently used or regarded to be promising.

Data No.: A057-01
Fluids:
Category: PVT-X, Solubility
Enthalpy

Author(s): Eriksson,K. Jerngrist,Å.
Title: Berähningsmetoder för sorptionsvärmepumpar i entalpi-koncentrationsdiagram.
Title Eng: Calculation methods for sorption heat pumps in enthalpy-concentration diagram.
Source: Report LUTKOH/(TKKA-1003)/1-83/(1986).
Corp_src: Dep. Chem. Eng, Lund Inst. Tech., Sweden.
Paper No.: E010 Language: Swedish
Reviewer: Sweden Doc.type: Report
Comment: Calculation methods for AHP type I and II are described and graphically demonstrated in enthalpy-concentration charts.

Author(s): Eriksson,K.
Title: Absorption heat pumps and heat transformers - a study of calculation methods, heat exchange and self-circulation.
Source: LUTKDH/(TKKA-1003)/1-11/(1987).
Corp_src: Dep. Chem. Eng. 1, Chem. Center, Lund Inst. Tech., Sweden.
Paper No.: E009 Language: English
Reviewer: Sweden Doc.type: Report; Dissertation
Comment: Describes calculation methods, different absorption cycles and a heat transformer working with self-circulation.

Author(s): Fujimaki,S. Kurosawa,M. Mizushiro,K.
Nozu,H. Yoshikawa,M.
Title: 高効率ガス吸収冷温水機の開発
Title Eng: Development of a high-efficiency gas-fired absorption chiller heater.
Source: 日本冷凍協会学術講演会論文集; Proc. JAR Annual Conf., p.39, 1980.
Paper No.: D221 Language: Japanese
Reviewer: Japan-I Doc.type: Conference
Comment: Introduces methods for achieving an improved efficiency of gas absorption chiller-heaters and actual measurement values. Gives importance not merely to characteristics of full load, but also of partial load.

Data No.: D221-01
Fluids: NS
Category: Refrigerating_machine, COP
Operation_or_control

Author(s): Fukuda,T. Usui,S.
Title: 空気熱源フロン吸収式冷暖房機の研究（第４報　溶液ポンプの検討）
Title Eng: Study on absorption cooling-heating systems with air heat source. Part 4: solution pump.
Source: 第17回空気調和・冷凍連合講演会講演論文集; Proc. 17th Air-Cond. Refrig. Conf. Japan, 1983, p148-151.
Paper No.: B061 Language: Japanese
Reviewer: Japan-J Doc.type: Conference proceedings

Data No.: B061-01
Fluids: R22, DMETEG
Category: Others

Author(s): Girsberger,W.
Title: Hochtemperatur-Absorptionswärmepumpe.
Title Eng: High temperature absorption heat pump.
Source: Dissertation, NP-4770474, Jan. 1981, 199p.
Corp_src: Eidgenössische Technische Hochschule, Zürich (Switzerland).
Paper No.: D048 Language: German
Reviewer: Germany Doc.type: Dissertation

Data No.: D048-01
Fluids: TFE, DWA
Category: Solubility
Pressure: 0.87 bar
Temp.: 100 - 190 ℃

Data No.: D048-02
Fluids: TFE, BZL
Category: Solubility
Pressure: 0.87 bar
Temp.: 100 - 190 ℃

Data No.: D048-03
Fluids: TFE, QUN
Category: Solubility
Pressure: 0.57, 0.87 bar
Temp.: 100 - 190 ℃

Data No.: D048-04
Fluids: HFIP, QUN
Category: PVT-X, Solubility
Pressure: Solubility: 1.09, 1.61 bar
Temp.: Solubility: 100 - 200 ℃; density: 20 ℃
Conc.: Density: 10 - 70 % molar fraction HFIP

Author(s): Goebel,Peter Diesing,Hartmuth
Title: Absorber.
Source: Patent no.131820, Jan. 1985 (Eur)
Corp_src: Vaillant, Joh., G.m.b.H. und Co.
Paper No.: D049 Language: English
Reviewer: Denmark Doc.type: Patent
Comment: The paper describes a new absorber design. No fluid studied.

Author(s): Gollin,M.K.
Title: Potential Role of Supercritical Fluid Processes in Absorption Heat Pumps. Final Report March-November 1986.
Source: GRI-86/0273, Dec. 1986, 68p.;NTIS, PC A04/MF A01
Corp_src: Dynatech R/D Co., Cambridge, MA. *Gas Research Inst., Chicago, IL.
Paper No.: D050 Language: English
Reviewer: USA Doc.type: Report
Comment: This study focused on the potential of supercritical fluid extraction processes for enhancing performance of absorption heat pumps. The author found that such processes depend on large changes in solubility near the critical point and, therefore, inappropriate for use with HAHP's. The reason is that a large portion of the energy input would be used for compression and can best be implemented with electric power. This reviewer also believes that operating control of absorption heat pumps near critical regimes would be almost impossible .

Author(s): Gomez,A.L. Mansoori,G.Ali
Title: Thermodynamic equation of state approach for the choice of working fluids of absorption cooling systems.
Source: Solar energy, Vol.31, No.6, 1983, p557-566.
Paper No.: D280 Language: English
Reviewer: Doc.type: Journal

Author(s): Grabenhenrich,H.B. Knoche,K.F.
Title: DEVELOPMENT AND PERFORMANCE OF A DIRECTLY FIRED AND PERIODICALLY OPERATING ABSORPTION HEAT PUMP.
Source: ASHRAE Trans., Vol.91, pt2B, (1985), 1828-1836.
Corp_src: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE)
Paper No.: D054 Language: English
Reviewer: Japan-B Doc.type: Report
Comment: (1) Reports on experiment with a trial-manufactured periodically operating heat pump (output 10kW). (2) Operated by selecting either absorption mode or generation mode. (3) Hot water is delivered from the absorber in the absorption mode, and from the condenser and exhaust gas cooler in the generation mode. (4) Compared to the conventional direct-fired boiler, up to 40%/year improvement of efficiency can be achieved. (5) Characterized by disuse of absorbent and refrigerant pumps.

Data No.: D054-01
Fluids: MA1, WA, LB
Category: Heat_pump
Temp.: Weak solution: 115℃; strong solution:25℃; hot water temp . obtained: 60℃

Author(s): Grafstörm,H. Malmström,L.
Title: Spillvärmesinventering för utinyttjande av absorptionsvärmepump för bostadsuppvärmning.
Title Eng: Waste heat inventory for the use of an absorption heat pump for domestic heating.
Source: BFR report, No.830679-3, 1983.
Corp_src: VBB AB, Stockholm.
Paper No.: E008 Language: Swedish
Reviewer: Sweden Doc.type: Report
Comment: The aim was to find a combination of industry with waste heat and a user as a distinct heating system. A paper industry and the distinct heating system in Varnersburg was chosen.

Data No.: E008-01
Fluids: WA, LB
Category: COP

Author(s): Gromoll,Bernd Kühl,Dieter
Title: Luft-Wasser-Absorptionswärmepumpe für die Hausheizung mit dem Stoffpaar Methanol-Lithumbromid/Zinkbromid.
Title Eng: Air-water absorption heat pump for domestic heating with the dual solute methanol lithium bromide/zinc bromide.
Source: Ki, Klima, Kälte, Heiz., 1984, vol.12, no.12, P.485-9.
Paper No.: D055 Language: German
Reviewer: Japan-B Doc.type: Journal
Comment: The marginal lower limit of the heat-source temperature (at evaporator inlet) rises, as the output temperature rises. In the case of high heat-source temperature, the COP is about 90% of theoretical value. (Fig.5) (2) When generated temperature is 80℃~105℃, heat output is 2.2~5.5kW, the COP is 1.5~1.625. When heat output is about 4kW, the COP becomes highest. Thereafter, the COP drops to 1.4, and output at that time becomes 7kW. (Fig.6) (3) When the heat-source temperature is below -5℃, heat output depends on the boiler system. When it is -5~2℃, it depends on both boiler system and heat pump. When it is higher than 2℃, it becomes possible to operate, with the heat pump alone.

Data No.: D055-01
Fluids: MA1, LB, ZB
Category: Heat_pump, COP
Practical_machine
Temp.: Ambient air:-5~20℃; hot water temp. obtained: 35~45℃; output temp.: 85~ 105℃

Author(s): Grossman,G. Michelson,E.
Title: A MODULAR COMPUTER SIMULATION OF ABSORPTION SYSTEMS.
Source: ASHRAE Trans., Vol.91, pt2B, (1985), 1808-1827.
Corp_src: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE)
Paper No.: D061 Language: English
Reviewer: Japan-D Doc.type: Report
Comment: For H2O/LiBr system, a single-stage transformer, a two-stage transformer, a single stage chiller were investigated. For NH3/H2O system, a single-stage heat pump was examined. As for the COP, the calculated value is

larger by. 16% at maximum than the actual measurement value. The heat loss becomes 7~12%. With this degree of accuracy, the proposed simulation method is useful.

Data No.: D061-01
Fluids: WA, LB
Category: Heat_pump, Refrigerating_machine
Temp.: Heat source:60~84℃(single stage), 38~ 121℃(double stage)

Author(s): Grossman,G.
Title: MULTISTAGE ABSORPTION HEAT TRANSFORMERS FOR INDUSTRIAL APPLICATIONS.
Source: ASHRAE Trans., Vol.91, pt2B, (1985), 2047-2061.
Corp_src: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE)
Paper No.: D062 Language: English
Reviewer: Japan-D Doc.type: Report
Comment: Covers almost all cycles. The evaluation criteria are simple and useful, and recommendable. Almost all can be expressed in terms of COP, TB and TSC. The cycles themselves can be expressed in terms of temperature level, pressure level and concentration level. The cycles are broadly divided into: (1) single-stage transformer, (2) large temperature rise width and low COP, (3) high COP and small temperature rise width and (4) chiller/ transformer combination.

Data No.: D062-01
Fluids: WA, LB
Category: Heat_pump, Refrigerating_machine

Author(s): Gustafsson,L.
Title: Laboratorieprovning av en absorptionsvärmepump med 50 kW värmeavgivning.
Title Eng: Laboratory test of an absorption heat pump with 50 kW heat load.
Source: Report No.UL-FUD-B 84,8.
Corp_src: Vattenfall.
Paper No.: E018 Language: Swedish
Reviewer: Sweden Doc.type: Report
Comment: The report describes the testing of an absorption heat pump for the use in a public bath. The heat load is 48 kW.

Data No.: E018-01
Fluids: WA, LB
Category: COP

Author(s): Hallenberg,J.
Title: Absorptionsvärmepump för t llvaratagande av spillvärme från Domnarvets Jernverk.
Title Eng: Absorption heat pump for recovering waste heat from the ironworks at Domnarvet.
Source: BFR report, No.810968-2, 1984.
Corp_src: BFR (Swedish Building Council).
Paper No.: E007 Language: Swedish
Reviewer: Sweden Doc.type: Report
Comment: Study of the possibilities to connect an AHP to the

ironworks. The premises are listed. Waste energy from

cooling air in oxygen work, drive energy from LP-gas exhaust gases at plastic-coating production.

Data No.: E007-01
Fluids: WA, LB
Category: COP

Author(s): Hasaba,S. Uemura,T. Inoue,S. Tanaka,K.
Title: 吸収冷凍機の自動排気装置について
Title Eng: A study of an automatic exhaust system for absorption refrigerating machine.
Source: 冷凍; Refrigeration, Vol.39-446, p.1, 1964.
Paper No.: D222 Language: Japanese
Reviewer: Japan-D Doc.type: Journal
Comment: Original paper on air intake/exhaust devices which are indispensable for H2O/LiBr absorption refrigerating machines. (1) Atmospheric pressure and room temperature. (2) Uses air as noncondensable gas, and lithium bromide solution as working fluid. (3) This system is such that, by carrying gas with liquid flow as two-phase flow, gas and liquid are separated. (4) Data on an actual machine are desirable.

Data No.: D222-01
Fluids: WA, LB
Category: Others
Pressure: Atmospheric pressure
Temp.: Room temperature
Conc.: 0,54.2%

Author(s): Hasseler,L.G.
Title: Heat transformers.
Source: AERE-R10111. April 1982. (Unclassified).
Paper No.: B074 Language: English
Reviewer: Japan-I Doc.type:
Comment: U.S.A. Patent Gazette on refrigerant/absorbent for an air-cooled absorption refrigerating machine. In the case of an air-cooled absorption refrigerating machine, the crystallization region of ansorbent becomes a problem. As a method for preventing the absorbent from crystallization, this invention claims H2O/LiI-LiBr system to which LiI is added, and a drop of crystallization temperature by adding ethylene glycol.

Author(s): Hayes,F.C. Modahl,R.J.
Title: EVALUATION OF ADVANCED DESIGN CONCEPTS FOR ABSORPTION HEAT PUMPS.
Source: CONF-841231; DE860002984; Research and development on heat pumps for space heating applications: Proceedings of the DOE/ORNL Heat Pump Conf., Aug 1985, pp.291-303; NTIS, PC A12/MF A01; 1.
Corp_src: Oak Ridge National Laboratory, TN (USA) (4832000)
Paper No.: D064 Language: English
Reviewer: Japan-H Doc.type: Report Article; Conference
Comment: This paper describes the results of evaluation of various new types of gas-fired absorption heat pump for space

heating. The target COP is 1.6 at 8℃ and 1.2 at -8℃ in the heating mode, and 0.7 at 35℃ in the cooling mode. Main cycles examined are: (1) GAX cycle, (2) Regenerative cycle and (3) Resporption cycle. As a result of examination, NH3/H2O/LiBr, CH3NH2/H2O/LiBr and NH3/H2O were promising.

Data No.: D064-01
Fluids: AM, WA
Category: Heat_pump, Refrigerating_machine
COP

Data No.: D064-02
Fluids: R22, DMETEG
Category: Heat_pump

Data No.: D064-03
Fluids: R123a, ETFE
Category: Heat_pump, Refrigerating_machine
COP

Data No.: D064-04
Fluids: WA, LB
Category: Heat_pump, Refrigerating_machine
COP

Data No.: D064-05
Fluids: AM, WA, LB
Category: Heat_pump, Refrigerating_machine
COP

Data No.: D064-06
Fluids: MA, WA, LB
Category: Heat_pump, Refrigerating_machine
COP

Data No.: D064-07
Fluids: MA1, LB, ZB
Category: Heat_pump, Refrigerating_machine
COP

Author(s): Heppenstall,T.
Title: A theoretical and experimental investigation into the performance of absorption cycle heat pumps applied to industrial processes.
Source: EUR-9236; Energy Conserv. Ind., vol.1, P.243-52, 1984.
Corp_src: Comm. Eur. Communities
Paper No.: D065 Language: English
Reviewer: Denmark Doc.type: Report
Comment: A test is also mentioned. The data given for this plant are: (1)evaporating temperature 30-45℃ (2)condensing temperature 55-80℃ (3)generator temperature 110-150℃ (4)COP 1.3-1.5 (5)heat output 9.0 kW.

Data No.: D065-01
Fluids: WA, LB
Category: Heat_pump, Absorber_(Absorption)
Vertical, Inside_of_tube
Pressure: 30 mmHg
Temp.: 34.9-63.0 ℃, mean film temperature

Author(s): Holmberg,P.
Title: System studies and optimization of the single stage absorption heat transformer cycle.
Source: Licentiate treafise.
Corp_src: Chalmers University of Technology.
Paper No.: E026 Language: English
Reviewer: Sweden Doc.type: Dissertation
Comment: A computer program has been developed to simulate a heat transformer. The most sensitive component for the optimization is the solution heat exchanger. When comparison between LiBr-H2O and HaOH-H2O, KOH-H2O and H2SO4 were made, it was found that KOH-H2O was good or better than LiBr-H2O.

Data No.: E026-01
Fluids: WA, LB
Category: Heat_pump, COP

Data No.: E026-02
Fluids: WA, SH
Category: Heat_pump, COP

Data No.: E026-03
Fluids: WA, PH
Category: Heat_pump, COP

Data No.: E026-04
Fluids: WA, SA
Category: Heat_pump, COP

Author(s): Hour,M.H. Bugarel,R.
Title: Double-effect absorption heat pump.
Source: Entropie (France), 1984, vol.20, no.118, P.3-7.
Paper No.: D067 Language: French
Reviewer: Belgium Doc.type: Journal

Author(s): Huor,M.H.
Title: Absorption Heat Pumps: Analysis of Part Load Operation and Double Effect. Study of the Absorber.
Source: These (D. Ing.), 1982, FRNC-TH-1970, 339p; NTIS, PC A15/MF A01, U.S. sales only.
Corp_src: Instisut National Polytechnique, Toulouse (France).
Paper No.: D069 Language: French
Reviewer: Belgium Doc.type: Dissertation

Author(s): Hölbling,W. Petrin,W. Schnitzer,H. Moser,F.
Title: Bewertung von Arbeitsstoffgemischen für Absorptionswärmepumpen.
Title Eng: Evaluation of operational mixtures for absorption heat pumps.
Source: Ki Klima-Kälte-Heizung, 1/1986, p19-24.
Paper No.: E028 Language: German
Reviewer: Doc.type: Journal

Author(s): Ikeuchi,M. Ozaki,E. Yumikura,T.
Yamanaka,G.
Title: 吸収式ヒートポンプの特性実験
Title Eng: Experimental study of an absorption heat pump.
Source: 第18回空気調和・冷凍連合講演会講演論文集; Proc. 18th Air-Cond. Refrig. Conf. Japan, 1984, p73-76.
Paper No.: D240 Language: Japanese
Reviewer: Doc.type: Conference

Author(s): Ikeuchi,M. Yumikura,T. Ozaki,E.
Yamanaka,G.
Title: Design and performance of a high-temperature-boost absorption heat pump.
Source: ASHRAE Trans., Vol.91, Pt.2, 1985, p2081-2094.
Paper No.: D270 Language: English
Reviewer: Doc.type: Journal

Author(s): Ishihane,K. Asai,S. Usui,S.
Ouchi,T. Hamada,Y.
Title: 空気熱源フロン吸収式冷暖房機の研究（第2報　ヒートポンプサイクルの特性）
Title Eng: A study of air-sourced absorption cooling and heating machines. 2nd report: Characteristics of heat pump cycles.
Source: 第16回空気調和・冷凍連合講演会講演論文集; Proc. 16th Air-Cond. Refrig. Conf. Japan, p.117, 1982.
Paper No.: D220 Language: Japanese
Reviewer: Japan-D Doc.type: Conference
Comment: (1) Heating capacity of a machine whose cooling capacity is 2RT. (2) The results were obtained for an absorption type heat pump that uses R22. (3) Most close to commercialization as an absorption type that realizes an air-source heat pump. (4) Serves as a basis for evaluation of advanced cycles.

Data No.: D220-01
Fluids: R22, DMETEG
Category: Heat_pump, COP
Operation_or_control
Temp.: Open air:7,10,13℃, Room:21℃, Gnenerator:100～135℃

Author(s): Ismail,I. Meunier,F.
Title: Pompe a Chaleur Chimique Utilisant Le Cycle Pseudo-Continu Zeolithe H2O: Résultats Expérimentaux et Simulation Numérique.
Title Eng: Chemical heat pump using the semi-continuous cycle zeolite-H2O: Experimental results and numerical simulation.
Source: Proc. XVth Int. Cong. Refrigeration Tome II, 1983, p.363-371, Paris.
Paper No.: E042 Language: French
Reviewer: Belgium Doc.type: Conference proceedings
Comment: The same data is contained as in Paper No. E035.

Data No.: E042-01
Fluids: WA, Z1
Category:

Author(s): Ismail,I. Karagiorgas Meunier,F.
Rios,J.
Title: Adsorption heat pump using the zeolithe water pair for management of heat.
Source: Energy Economics and Management in Industry - supplement, A.Reis, J.L.Peube, I.Smith, and K.Stephan (eds.), 1984, p.35-40, Pergamon Press.
Paper No.: E035 Language: English
Reviewer: Belgium Doc.type: Book

Data No.: E035-01
Fluids: WA, Z1
Category: Heat_pump, COP
Temp.: 50 C to 160 C.

Author(s): Iyoki,S. Koshiyama,H. Uemura,T.
Title: C2H5OH-LiI 系吸収冷凍機の性能および動作特性について
Title Eng: Performance and operating characteristics of the methanol-lithium iodide absorption refrigerating machine.
Source: 日本冷凍協会学術講演会論文集; Proc. JAR Annual Conf., 1982, p21-24.
Paper No.: D249 Language: Japanese
Reviewer: Doc.type: Conference

Author(s): Jeday,M.R. Le Goff,P.
Title: Recherche du sorbant optimal pour les pompes à chaleur à absorption et les machines mixo-mécaniques. 2'partie: application aux solutions dans l'ammoniac liquide.
Title Eng: Search for an optimal sorbent for absorption heat humps and mechanical mixing machines. Part 2: application to solutions in liquid ammonia.
Source: Int. J. Refrig., Vol.11, 1988, p164-172.
Paper No.: D264 Language: French
Reviewer: Belgium Doc.type: Journal
Comment: Paper does not contain specific property data.

Data No.: D264-01
Fluids: NS
Category:

Author(s): Johnson,S.E.
Title: A look at today's absorption refrigeration.
Source: ASHRAE J., P55, 1960-9.
Paper No.: D195 Language: English
Reviewer: Japan-D Doc.type: Journal
Comment: Describes a purge system and capasity control.

Data No.: D195-01
Fluids: WA, LB
Category: Refrigerating_machine, Operation_or_control
Others

Author(s): Kandlikar,S.G.
Title: A new absorber heat recovery cycle to improve COP of aqua-ammonia absorption refrigeration system.
Source: ASHRAE Trans., Vol.88, Pt.1, 1982, p141-158.

Paper No.: D271　　Language:　English
Reviewer:　　　　　Doc.type:　Journal

Author(s): Karlsson,M.
Title: Paperikonelämpöpumput.
Title Eng: Heat pumps in paper industry.
Source: Report, Valmet Oy, Turku 1987.
Corp_src: Valmet Paperikoneet Oy.
Paper No.: E025　　Language:　Finish
Reviewer: Sweden　Doc.type:　Report
Comment: Feasibility study of applications and profitability of heat pumps using hood exhaust air as a heat source. AHP and EHP were compared in three different applications but none of them were profitable in Finland where the price of electricity is around 160 mK/MWh.

Data No.: E025-01
Fluids: WA, LB
Category: Heat_pump, COP

Author(s): Kashiwagi,T. Kurosaki,Y. Ito,S. Kato,T.
Title: 第二種吸収式ヒートポンプの特性シミュレーション
Title Eng: Simulation of the characteristics of a heat transformer.
Source: 第19回空気調和・冷凍連合講演会講演論文集; Proc. 19th Air-Cond. Refrig. Conf. Japan, 1985, p113-116.
Paper No.: D238　　Language:　Japanese
Reviewer:　　　　　Doc.type:　Conference

Author(s): Kaushik,S.C. Bhardwaj,S.C.
Title: THEORETICAL ANALYSIS OF AMMONIA-WATER ABSORPTION CYCLES FOR REFRIGERATION AND SPACE CONDITIONING SYSTEMS.
Source: Int. J. Energy Res., Jul 1982, vol.6(3), p.205-226, CODEN: IJERDN, ISSN: 0363-907X.
Paper No.: D083　　Language:　English
Reviewer: Japan-B　Doc.type:　Journal
Comment: Presents a simulation of ammonia-water absorption cycles for solar refrigeration, air conditioning and heat pump operations. In Japan, since there has been less research on ammonia-water refrigerating machines, this is interesting as a cycle simulation. However, as for commercialization, it will be unfavorable to realize air conditioning with this machine.

Data No.: D083-01
Fluids: AM, WA
Category: Refrigerating_machine

Author(s): Kaushik,S.C. Kumar,R.
Title: Computer-aided conceptual thermodynamic design of a two-stage dual fluid absorption cycle for solar refrigeration.
Source: Sol. Energy (USA), 1985, vol.35, no.5, P.401-7.
Paper No.: D078　　Language:　English
Reviewer: Japan-B　Doc.type:　Journal
Comment: Shows the results of computer simulation. COP of this

system lies midway between two-stages of NH3-H2O system and two-stages of H2O-LiBr system, and is about 0.3. Although it is an interesting idea, commercialization will be difficult as it is costly.

Data No.: D078-01
Fluids: WA, AM, LB
Category: COP
Temp.: Tc2=303K,313K:TG1=343K:TE2=253K,263K:TG2=373K,383K,393K,403K

Author(s): Kaushik,S.C. Kaudinya,J.V. Chandra,S.
Title: Diurnal response of an open roof solar regenerator system for absorption air-conditioning.
Source: Energy Convers. & Manage. (GB), 1985, vol.25, no.1, P.21-7.
Paper No.: D079 Language: English
Reviewer: Japan-B Doc.type: Journal
Comment: By designing the regenerator as an open type, an absorption refrigerating machine system has been composed, achieving 0.36~0.57 of COP. The solar heat is used as the driving source. To commercialize it, it must be improved in many respects. However, performance evaluation of the data along the hourly changes in solar heat will be useful.

Data No.: D079-01
Fluids: WA, LB
Category: Operation_or_control, Generator
Pressure: Vapor pressure in ambient air:13.22mmHg
Temp.: Ambient air:35℃; inlet temp. of weak solution:45℃
Conc.: Weak solution:41%
Memo1: Length of open type generator:6.0m; relative humidity of ambient air:30%

Author(s): Kaushik,S.C. Kumar,R.
Title: Thermodynamic study of a two-stage vapour absorption refrigeration system using NH/sub 3/refrigerant with liquid/solid absorbents.
Source: Energy Convers. & Manage. (GB), vol.25, no.4, P.427-31, 1985.
Paper No.: D080 Language: English
Reviewer: Japan-B Doc.type: Journal
Comment: Compared the simulation of single-stage and two-stage solar refrigerating machines operating with NH3/H2O or NH3/LiNO3 mixtures. (1) Single-stage cycle is normal single-effect cycle. (2) Two-stage cycle is that chilled water of primary side cycle is used for cooling the secondary side cycle absorber.

Data No.: D080-01
Fluids: AM, LNT, WA
Category: Refrigerating_machine, COP

Author(s): Kaushik,S.C. Chandra,S.
Title: Computer modeling and parametric study of a double effect generation absorption refrigeration cycle.
Source: Energy Convers. & Manage. (GB), vol.25, no.1, P.9-14, 1985.
Paper No.: D081 Language: English

Reviewer: Japan-B Doc.type: Journal
Comment: The results of simulation where the quantity of heat exchanged in the low temperature generator of a double-effect absorption refrigerating machine is kept constant, while temperature conditions of component units (absorber, evaporator and condenser) are changed.

Data No.: D081-01
Fluids: WA, LB
Category: Refrigerating_machine, COP

Author(s): Kaushik,S.C. Kumar,R. Chandra,S.
Title: Thermal modelling and parametric study of two stage absorption refrigeration and air-conditioning systems.
Source: Int. J. Energy Res. (GB), vol.9, no.4, P.391-402, Oct.-Dec. 1985.
Paper No.: D082 Language: English
Reviewer: Japan-B Doc.type: Journal
Comment: Concerning the two-stage absorption refrigerating machine which utilizes the solar energy, one for refrigeration and the other for air-conditioning use were simulated. One with water-lithium bromide and the other with ammonia-water were compared. Promising as a low temperature heat-source absorption system.

Data No.: D082-01
Fluids: WA, AM, LB
Category: Refrigerating_machine

Author(s): Kiatsiriroat,T. Bhattacharya,S.C. Wibulswas,P.
Title: Upgrading heat by a reversed absorption heat pump.
Source: Appl. Energy (GB), vol.25, no.3, P.175-86, 1986.
Paper No.: D084 Language: English
Reviewer: Japan-D Doc.type: Journal
Comment: (1) Simulation of a heat transformer. (2) Uses factory waste heat and solar heat connected by flat panel collectors as its heat source. (3) Deserves no special remarks.

Data No.: D084-01
Fluids: WA, LB
Category: Heat_pump, COP
Temp.: Heat source:70~ 110℃; Ambient air:30℃; Temperature diff erence at heat exchanger outlet:5℃
Memo1: Water flow rate:0.5kg/s; Area of collector:70m2; Collector efficiency:0.7

Author(s): Knoche,K.F. Grabenhenrich,H.B.
Title: Development and performance of a directly fired and periodically operating absorption heat pump.
Source: EUR-10007-EN; Comm. Eur. Communities, (Rep.) EUR (1985); Absorpt. Heat Pumps Congr., P.250-63.
Corp_src: Comm. Eur. Communities
Paper No.: D087 Language: English
Reviewer: Japan-B Doc.type: Report; Conference
Comment: (1) A directly fired and periodically operating absorption heat pump is more efficient than conventional combustion

furnace type, and excels in power, noise level, etc. (2) By devising an experimental machine, efficiency and performance were measured. (Compared with data analysis by computer. The analytical results presented a higher efficiency.) (3) An ideal absorption heat pump is by about 40% higher in overall efficiency than conventional combustion furnace type.

Data No.: D087-01
Fluids: MA1, WA, LB
Category: Heat_pump, Practical_machine
Temp.: 35~60℃(water temp. obtained)
Conc.: MA-WA/LB(50:3:47)

Author(s): LeBlanc,B.
Title: Gaz et Pompes à Chaleur en France.
Title Eng: Gas and heat pumps in France.
Source: Proc. Int. Gas Research Conf., 1986, p.262-271.
Paper No.: E047 Language: French
Reviewer: Belgium Doc.type: Conference proceedings
Comment: Paper does not contain specific property data.

Data No.: E047-01
Fluids: NS
Category:

Author(s): Linetskii,S.B. Rodnyanskii,L.S. Tsirlin,A.M.
Title: Maximum capabilities of refrigeration-machine and heat-pump cycles.
Source: Power Eng. (J. Acad. Sci. USSR) (USA), 1985, vol.23, no.6, P.124-34, Trans.P.114-24.
Paper No.: D095 Language: English
Reviewer: Japan-H Doc.type: Journal
Comment: Derived an equation for calculating maximum refrigerating machine efficiency, intended to use it for cycle evaluation. However, it does not seem to be very effective.

Data No.: D095-01
Fluids: NS
Category: Heat_pump, COP

Author(s): Lourdudoss,S. Stymne,H.
Title: An energy storing absorption heat pump process.
Source: Cnt. J. Energy Res. (GB), vol.11, no.2, P.263-74, April-June 1987.
Paper No.: D097 Language: English
Reviewer: Japan-H Doc.type: Journal
Comment: Proposed a brand-new heat pump system that can utilize a phase change from solid salt to saturated solution. By presenting combinations of 6 types of substance, relations between enthalpy and concentration were examined . As a result, it was found that, although the new system is a little lower in COP than conventional processes , the heat storage density can be increased. Additionally, 4 types of substance (LiCl.H2O/H2O, LiBr.H2O/H2O, LiBr/CH3OH, and KHO.H2O/H2O) suitable for heating use were selected.

Data No.: D097-01
Fluids: WA, LC
Category: Heat_pump, COP

Data No.: D097-02
Fluids: WA, CC
Category: Heat_pump, COP

Data No.: D097-03
Fluids: WA, LB
Category: Heat_pump, COP

Data No.: D097-04
Fluids: WA, PH
Category: Heat_pump, COP

Data No.: D097-05
Fluids: MA1, LB
Category: Heat_pump, COP

Data No.: D097-06
Fluids: EA1, LB
Category: Heat_pump, COP

Author(s): Lundborg,H. Morawetz,E. Nilsson,R.
Title: Resorptions- eller absorptionsvärmepump för värmeverk i Lomma.
Title Eng: Resorption- or absorption heat pump for the heating plant in Lomma.
Source: Report R109, 1987.
Corp_src: BFR (Swedish Council of Building Research).
Paper No.: E021 Language: Swedish
Reviewer: Sweden Doc.type: Report
Comment: A comparison of three different heat pumps to heat a distinct heating system. AHP, resorption heat pumps and EHP. Specific production costs were equal, and more expensive than a new oil-fired pan.

Author(s): Malmström,L.
Title: Absorptionsvärmepump för utnyttjande av industriell spillvärme.
Title Eng: Absorption heat pump for utilization of industrial waste heat.
Source: ESP VRT 83:1, VBB AB, Stockholm.
Paper No.: E005 Language: Swedish
Reviewer: Sweden Doc.type: Report
Comment: Description of the design and function of AHP. Economic review and experiences from AHP-plants in Japan, Germany. A presentation is given of an AHP designed for a specific combination between an industry and a receiver.

Author(s): Marsala,J. Whitlow,E.P. Phillips,B.A.
Title: Development of a Residential Gas Fired Absorption Heat Pump. Component Development and Field Trial Program. Final Report.
Source: ORNL/Sub-79-24610/3, August 1985, 235p; NTIS, PC A11/MF A01
Corp_src: Phillips Engineering Co., St.Joseph, MI. *Department of

Energy, Washington, DC.
Paper No.: D101 Language: English
Reviewer: Japan-D Doc.type: Report
Comment: (1) Used when outdoor temperature is -18℃. R133a/ETFT system. Residential use. (2) 6 test-units were manufactured whose heating capacity is 17.6kW and 21.1 kW. (3) Developed main components, auxiliary components and solution pump; designed, composed, trial-manufactured and tested the unit. (4) Trial-manufactured 6 units, of which 5 operate in summer and winter. The cooling COP is not enough.

Data No.: D101-01
Fluids: R133a, ETFE
Category: Heat_pump, COP
Operation_or_control
Temp.: Ambient air: -18℃; Evaporator:-17～ 9℃; Cooling water:30～41℃
Memo1: R133a+ETFE:41～45kg

Author(s): Mashimo,K. Masuda,T. Nakayama,T. Hashimoto,M.
Title: 有機系作動媒体ＴＦＥ／ＮＭＰの開発と吸収冷凍システムへの応用
Title Eng: Application of organic working fluids TFE/NMP to absorption refrigerating systems.
Source: 第21回空気調和・冷凍連合講演会講演論文集; Proc. 21th Air-Cond. Refrig. Conf. Japan, 1987, p109-112.
Paper No.: D233 Language: Japanese
Reviewer: Doc.type: Conference

Author(s): Matsson,L-O. Landare,S. Wanselius,K.
Title: Naturgasvärmepumpar i anslutning till sydgasnätet.
Title Eng: Natural gas heat pumps connecting to the South Sweden Gas network.
Source: Report R114, 1984.
Corp_src: BFR (Swedish Council of Building Research).
Paper No.: E015 Language: Swedish
Reviewer: Sweden Doc.type: Report
Comment: Description of an AHP and discussion of the consequences, if gas fired AHP are introduced to the gas grid, which is installed in south Sweden.

Author(s): Merrick,R.H.
Title: ARKLA AMMONIA-WATER ABSORPTION HEAT PUMP.
Source: Proceedings of the 1981 international gas research conference. Rockville, MD, USA; Government Institutes, Inc. 1982. pp.1262-1267.
Paper No.: D106 Language: English
Reviewer: USA Doc.type: Book Article; Conference
Comment: Heating-only AHP with excellent thermodynamics, mechanical simplicity, non-reversing design. Air source design delivering hot water as output. COP of 1.25 at 8.3℃ and 1.12 at -8.3℃. Three prototypes were developed and tested -- (1) 1st to assemble the components into product design. (2) 2nd to finalized defrost system. (3) 3rd to introduce refinements in handling the generator flue products.

Author(s): Meunier,F.
Title: Pompe à Chaleur Statique à Absorption Utilisant le Couple Eau - Zéolithes.
Title Eng: Absorption static heat pump using the water-zeolite pair.
Source: Aide M.I.R. No. 80-7-0024 and 80-7-0025, p.325-349.
Paper No.: E040 Language: French
Reviewer: Belgium Doc.type:

Data No.: E040-01
Fluids: WA, Z1
Category: Solubility, Heat_pump
Refrigerating_machine, COP
Temp.: 20 to 180 C

Author(s): Mezon,J.
Title: Etude expérimentale d'une boucle prototype de pompe à chaleur à absorption haute temperature à usage industriel de 100kW.
Title Eng: Experimental study of a 100kW prototype loop for an industrial high-temperature absorption heat pump.
Source: EUR-10007-EN; Comm. Eur. Communities, (Rep.) EUR (1985); Absorpt. Heat Pumps Congr., P.303-13.
Corp_src: Comm. Eur. Communities
Paper No.: D107 Language: French
Reviewer: Japan-H Doc.type: Report; Conference
Comment: Reports about a demonstration test on an 100kW absorption heat pump using an auxiliary fluid which was manufactured by Gas de France and Greusot-Loire. Evaporation temperature of this unit is 55~65℃, and the operating temperature is 120~130℃. 1.2~1.56 of COP was obtained without heat recovery. Simply reporting an outline, this paper does not seem to be of much significance.

Data No.: D107-01
Fluids: AM, WA
Category: Refrigerating_machine, COP

Author(s): Mohanty,B. Prevost,M. Bugarel,R.
Title: Partial or overloading of an absorption cycle: sensitivity study of parameters in heating and cooling modes.
Source: Heat Recovery Systems, Vol.5(4), 1985, p.341-352.
Paper No.: E036 Language: English
Reviewer: Belgium Doc.type: Journal

Data No.: E036-01
Fluids: R21, DMETEG
Category: Heat_pump, Refrigerating_machine
COP, Operation_or_control
Temp.: evaporation: 10 C, absorption: 30 to 50 C, generation: 70 to 110 C.

Author(s): Morawetz,E.
Title: Absorptiosvärmepump i Åkarp.
Title Eng: Absorption heat pump at Åkarp.
Source: Report R17, 1983.
Corp_src: BFR (Swedish Council of Building Research).
Paper No.: E023 Language: Swedish

Reviewer: Sweden Doc.type: Report
Comment: Technical and economical investigation of the premises to install an AHP for domestic heating in the community of Burlov. The investigation show a pay-off time for a LiBr AHP to 8.5-8.8 years. The community changed from oil to gas heating.

Data No.: E023-01
Fluids: AM, WA
Category: Heat_pump

Data No.: E023-02
Fluids: WA, LB
Category: Heat_pump

Author(s): Morawetz,E.
Title: Flerstegsabsorptiosvärmepumpar.
Title Eng: Multistage absorption heat pumps.
Source: Report R50, 1983.
Corp_src: BFR (Swedish Council of Building Research).
Paper No.: E016 Language: Swedish
Reviewer: Sweden Doc.type: Report
Comment: Description and classification of multiple stage AHP.

Author(s): Morawetz,E. Bäckström,P.
Title: Värmedrivna spillvärmespumpar i Billesholm.
Title Eng: Heat driven waste heat pumps in Billesholm.
Source: Report R51, 1983.
Corp_src: BFR (Swedish Council of Building Research).
Paper No.: E017 Language: Swedish
Reviewer: Sweden Doc.type: Report
Comment: Comparison between a steam driven AHP, a gas-fired AHP and two gas-driven compressor heat pumps for production of heat, utilizing waste heat from an industry.

Data No.: E017-01
Fluids: AM, WA
Category: COP

Author(s): Morawetz,E.
Title: Absorptionsvärmepump och energitransformator vid Alifax AB i Malmö.
Title Eng: Absorption heat pump and heat transformer at Alifax Co. in Malmo.
Source: BFR report, No.830880-9, 1984.
Corp_src: BFR, (Swedish Council for Building Research).
Paper No.: E006 Language: Swedish
Reviewer: Sweden Doc.type: Report
Comment: A pilot study investigating the technical premises for the installation of gas driven AHP type I or a waste heat driven AHP type II at a company producing gases. The conclusion was that the premises were not advantageous.

Data No.: E006-01
Fluids: WA, LB
Category: COP

Author(s): Morawetz,E. Bäckström,P.
Title: Absorptionsvärmepump för utvinning av värme ur avloppsvatten från ett tvätteri.
Title Eng: Absorption heat pumps for recovering heat from waste-water in a laundry.
Source: BFR report, No.840513-8, 1985.
Corp_src: BFR (Swedish Building Council).
Paper No.: E012 Language: Swedish
Reviewer: Sweden Doc.type: Report
Comment: Investigates the premises for an AHP in a laundry and compares with an EHP. Hitachi Zosen's AHP is found more convenient than Sanyo's. Pay-off time: AHP 1.5 year, EHP 4.1 year.

Data No.: E012-01
Fluids: WA, LB
Category: COP

Author(s): Morawetz,E.
Title: Sorption - Compression Heat Pumps and Heat Transformers. Technology and Economics - a Feasibility Study.
Source: BFR-R-38-1986, 1986 (Sweden), 96p; NTIS, PC A05/MF A01, U.S. sales only.
Corp_src: Swedish council for Building Research, Stockholm.
Paper No.: D117 Language: Swedish
Reviewer: Sweden Doc.type: Report
Comment: A pilot study of a system with a steam compression between high and low pressure levels. A high pressure absorber substitute the condenser and a low pressure desorber substitute the evaporator. With an electricity cost less than 0.25 SKr/kWh. This heat pump is more advantageous than a heat transformer.

Author(s): Morrissey,A.J. O'Donnell,J.P.
Title: THE USE OF ENDOTHERMIC REFRIGERANT/ABSORBENT SYSTEMS IN ABSORPTION HEAT PUMPS.
Source: Solar energy applications to dwellings. Proc.of the EC Contractors' meeting, Brussels, June 1983. Dordrecht, Netherlands: D.Reidel Publishing Company.1984 pp.339-349.
Paper No.: D119 Language: English
Reviewer: Denmark Doc.type: Book Article; Conference
Comment: A standard LiBr/H2O heat pump, type ARKLA SOLAIRE 36, is used with KNCS/H2O. Reference D127 gives the same information more elaborated.

Author(s): Moss,Gerald
Title: Pumping heat using an absorption heat pump.
Source: Patent no.2144762 (GB), March 1985.
Corp_src: Exxon Reserach and Engineering Co.
Paper No.: D120 Language: English
Reviewer: USA Doc.type: Patent
Comment: The investigation covers a new category of absorption heat pump working fluids derived from reacting a water soluble Group IIa metal compound such as CaCl2 or SrCl2 with a Group I a metal oxide or hydroxide such as Na or K Hydroxide. Only a small amount of the Group II a compound is required to modify the crystallization characteristics

of concentrated solutions of H2O-NaOH or KOH so that they can remain at room temperature. A typical formulation that remains fluid above 20 ℃ is 40/10/22 parts by weight of NaOH/CaCl2/H2O.

Author(s): Murphy,K.P. Phillips,B.A.
Title: Development of a residential gas absorption heat pump.
Source: Int. J. Refrig., Vol.7, No.1, 1984, P56-58.
Paper No.: D189 Language: English
Reviewer: Japan-D Doc.type: Journal
Comment: Residential use (3RT in the cooling mode). Indirect air-cooled system. Being a single-effect unit, this system is inferior in COP (0.65 in the cooling mode) to the double-effect unit. Although it is advantageous where the heating load is overwhelmingly large, it is disadvantageous where there is a considerable degree of cooling load, as it is inferior to H2O/LiBr in cooling COP.

Data No.: D189-01
Fluids: R123a, ETFE
Category: Heat_pump, COP
Pressure: 36kPa,21kPa(evaporator); 210kPa,200kPa(condenser)
Temp.: 4.4℃,-6.2℃(evaporator); 50.3℃, 49.2℃(condenser);166℃,171℃(calculated generator temp.)
Memo1: Refrigerant flow rate:196,161(kg/h); Weak solution flow rate:420,467(kg/h); Input heat:17.7,17.5(kW), Output heat:22(

Author(s): Möhring,U. Fleischmann,R.
Title: Chemischer Wärmetransformator.
Title Eng: Chemical heat transformer.
Source: Chem.-Anlagen Verfahren, 1984, no.12, P.72, 76, 78.
Paper No.: D111 Language: German
Reviewer: Germany Doc.type: Journal
Comment: Report about the possibility of waste heat utilization using an absorption heat transformer. No further scientific information.

Data No.: D111-01
Fluids: WA, SA
Category: Heat_pump, Others

Author(s): Möhring,U. Fleischmann,R.
Title: Chemischer Wärmetransformator nach dem Absorptionsprinzip.
Title Eng: Chemical heat transformer according to the absorption principle.
Source: Chem.-Tech. (Heidelberg), 1984, vol.13, no.11, P.74, 76, 79.
Paper No.: D112 Language: German
Reviewer: Germany Doc.type: Journal
Comment: Information is identical with paper D111.

Author(s): Narayankhedkar,K.G. Maiya,M.P.
Title: Investigations on triple fluid vapor absorption refrigerator.
Source: Int. J. Refrig., Vol.8, Nov. 1985, p335-342.
Paper No.: D277 Language: English
Reviewer: Doc.type: Journal

Author(s): O'Donnell,J.P.
Title: The performance of an absorption heat pump using an endothermic refrigerant/absorbent system.
Source: EUR-10151-EN (1985), 63p.
Corp_src: Comm. European Communities, Luxembourg
Paper No.: D127 Language: English
Reviewer: Denmark Doc.type: Report
Comment: A standard heat pump for LiBr/H2O, type ARKLA SOLAIRE 36, has been used with KNCS/H2O.

Data No.: D127-01
Fluids: WA, KT
Category: Solubility, Enthalpy
Specific_heat, Heat_pump
Pressure: 20 mmHg
Temp.: generator: 42-55℃, evaporator: 13.8-30℃
Conc.: 43.56 mass%

Data No.: D127-02
Fluids: WA, LB
Category: Heat_pump, COP
Pressure: 20 mmHg
Temp.: generator: 56-90℃, evaporator: 1.5-10.5℃
Conc.: 52 mass%

Author(s): Ohuchi,Y.
Title: Development of a gas-fired absorption heat pump.
Source: ASHRAE. 1985, Vol.91, Pt.2, p292-363.
Paper No.: B140 Language: English
Reviewer: Japan-C Doc.type: Conference proceedings
Comment: Same in content as B119.

Author(s): Okamoto,Y. Kurosawa,M. Saito,S.
Inoue,N. Tanaka,S.
Title: 3S コントローラの開発
Title Eng: Development of a "3S" controller.
Source: 日本冷凍協会学術講演会講演論文集; Proc. JAR Annual Conf., p.29, 1983.
Paper No.: D215 Language: Japanese
Reviewer: Japan-I Doc.type: Conference
Comment: Developed a controller for a building air conditioning system which uses an absorption chiller-heater as a heat-source unit, reporting about methods for energy and labor saving and examples of measurement.

Data No.: D215-01
Fluids: NS
Category: Operation_or_control

Author(s): Okamoto,Y. Kurosawa,M. Ukaji,T.
Inoue,N. Hasegawa,T.
Title: ガス吸収冷温水機の運転特性について（第一報）
Title Eng: Operating Characteristics of a gas-fired absorption chiller heater.
Source: 日本冷凍協会学術講演会論文集; Proc. JAR Annual Conf., p.33,

1983.
Paper No.: D217 Language: Japanese
Reviewer: Japan-I Doc.type: Conference
Comment: Based on actual measurements of partial load characteristics of an absorption chiller-heater, some control system were compared with respect to the COP characteristics. Moreover, by providing a day's simulation load pattern, responses of a chiller-heater were measured.

Author(s): Osei-Bonsu,M.A. Treece,R.J.
Title: THE DEVELOPMENT OF ABSORPTION CYCLE HEAT PUMPS APPLIED TO INDUSTRIAL PROCESS HEAT RECOVERY.
Source: 3rd International Symposium on the Large Scale Applications of Heat Pumps, Oxford, England; 25-27 March 1987, Paper J1, p.197-204.
Paper No.: D130 Language: English
Reviewer: USA Doc.type: Report
Comment: A mathematical model describing the performance of a single-effect absorption cycle is presented. Also, an experimental apparatus (10kW heat output) was used to develop performance data using H2O-LiBr in temperature regions applicable to industrial heat pumping. Reasonable agreement was obtained between projected performance and the experimental measurements, usually within ±10%. The general applicability of the model to other absorption cycles and fluid systems is unknown.

Author(s): Perez-Blanco,H
Title: Absorption heat pump performance for different types of solution.
Source: Int. J. Refrig., Vol.7, No.2, 1984, P115.
Paper No.: D187 Language: English
Reviewer: Japan-H Doc.type: Journal
Comment: Concerning a simple heat pump model, this paper shows the results of calculation with a thermodynamic method for binary mixtures to determine which type of solution achieves the best in thermal performance with regard to a certain refrigerant. Activity coefficient of refrigerant at a certain temperature and concentration is obtained, and a range in which heat pump performance is maximized is shown. This study is a new attempt at performance calculation by means of activity coefficient of refrigerant.

Data No.: D187-01
Fluids: AM, WA
Category: Others, Heat_pump
COP
Memo1: Activity coefficients are involved.

Author(s): Petrin,W. Schnitzer,H. Moser,F.
Title: The maximum COP of individual working fluids in absorption heat pumps.
Source: Proceedings of the 3rd Austrian-Italian-Yugoslav chemical engineering conference. 276th event of the European Federation of Chemical Engineering. Vol. 2. Graz, Austria: Technische Universitaet. 1982.
Paper No.: D076 Language: English

Reviewer: Denmark Doc.type: Book Article; Conference; Availability Note
Comment: A general expression for calculating COP is proposed. A new article of the same authors about the same subject is: Bewertung von Arbeitsstoffgemischen fuer Absorptionswaermepumpen. Ki Klima-Kaelte-Heizung no.1, 1986.

Data No.: D076-01
Fluids: NS
Category: COP

Author(s): Phillips,B.A.
Title: High efficiency absorption cycles for residential heating and cooling.
Source: Proceedings of the 20th Intersociety Energy Conversion Eng. Conf., Energy for the Twenty-First Century, Vol.2, P.229-34, 1985.
Paper No.: D137 Language: English
Reviewer: USA Doc.type: Conference
Comment: (1)Very expert presentation of the subject. (2)Several advanced heat pump cycles proposed for evaluation. (3)Six different cycles analyzed. (4)Heating COP's over 2.0 projected with cooling COP's over 1.0. (5)NH3-H2O and NH3-H2O-LiBr proposed as candidate working fluids.

Author(s): Phillips,B.A.
Title: ANALYSES OF ADVANCED RESIDENTIAL ABSORPTION HEAT PUMP CYCLES.
Source: CONF-841231; DE86002984; Research and Devolopment on Heat Pumps for Space Conditioning Applications; Proceedings of the DOE/ORNL Heat Pump Conf. Aug 1985, pp.265-287; NTIS, PC A12/MF A01; 1.
Corp_src: Oak Ridge National Laboratory, TN (USA) (4832000)
Paper No.: D138 Language: English
Reviewer: Japan-D Doc.type: Report Article; Conference
Comment: Examined from the points of view of cycle efficiency, working fluid and fluid efficiency. (1) Aimed to achieve more than 1.78 of heating COP and 0.78 of cooling COP. (2) NH3/H2O and NH3/H2O/LiBr as working fluids. (3) Advanced cycles, such as double-effect, resorption, GAX, variable effect, two-stage GAX and 2R. (4) When a ternary system is used, the heating COP rises. (5) Advanced cycles are covered exhaustively.

Data No.: D138-01
Fluids: AM, WA
Category: Heat_pump, COP
Temp.: Heating: ambinet air -12~21℃(GAX), -34~44℃(AHE); Cooli ng: ambient air 27~38℃
Memo1: Generator:160~ 199℃(GAX), 204~ 232℃(double-effect); a mbient air:8.3℃

Data No.: D138-02
Fluids: AM, LB, WA
Category: Heat_pump, Refrigerating_machine COP
Temp.: Ambient air:-23~16℃; Evaporator:-23~10℃ (in GAX)
Conc.: LB:WA=6:4

Author(s): Pilatowsky,I. Best,R.
Title: Etude de L'Utilisation de CaCl2-NH3 Dans un Système Frigorifique Solaire à Absorption.
Title Eng: Study on the utilization of CaCl2-NH3 in a solar absorption refrigeration system.
Source: Proc. Int. Inst. Refrig. Conf., 1982, p.89-96, Jerusalem, Israel.
Paper No.: E043 Language: French
Reviewer: Belgium Doc.type: Conference proceedings

Data No.: E043-01
Fluids: AM, CC
Category: Solubility, Refrigerating_machine
COP
Temp.: Condenser: 20 - 40 C, evaporator: -20 - 10 C

Author(s): Privon,G.T.
Title: ENGINE-DRIVEN AND ABSORPTION HEAT PUMPS.
Source: CONF-841232; DE86002984; Research and Devolopment on Heat Pumps for Space Conditioning Applications; Proceedings of the DOE/ORNL Heat Pump Conf., Aug 1985 pp.211-214; NTIS, PC A12/MF A01; 1.
Corp_src: Oak Ridge National Laboratory, TN (USA) (4832000)
Paper No.: D140 Language: English
Reviewer: Japan-H Doc.type: Report Article; Conference
Comment: Reports on the state of development of gas engine driven heat pumps for cooling/heating which features a high thermal efficiency. In the case of a gas engine driven system, the shaft sealing method is important, and in the case of an absorption system, it is important to increase the performance of a counterflow heat exchanger and develop a more trouble-free solution heat pump. Describing only an outline of the development program, this report does not seem to be of much significance.

Data No.: D140-01
Fluids: NS
Category: Heat_pump

Author(s): Schlichtig,Ralph C.
Title: A new thermal cycle using low grade heat, a temperature pressure potential amplifier.
Source: Altern. Energy Sources, (Proc. Miami Int. Conf.), 6th, 1985, vol.4, P.103-12.
Paper No.: D153 Language: English
Reviewer: USA Doc.type: Book; Conference

Author(s): Schulz,S.
Title: Die Berechnung und Optimierung von Absor ptionskältemachinen-Prozessen mit Hilfe von EDV-Anlagen.
Title Eng: Calculation and optimisation of absorption refrigeration machine processes with the aid of electronic computers.
Source: Kältetechnik-Klimatisierung. Vol.24. 181-188. No.7. July 1972.
Paper No.: B178 Language: German
Reviewer: Japan-D Doc.type: Journal
Comment: Presents formulas for thermodynamic properties of

ammonia-water system, and cycle calculation using them. Since concentration of ammonia in the condenser considerably governs the performance, rectification is indispensable. COP and exergy coefficient are used to express the performance.

Data No.: B178-01
Fluids: AM, WA
Category: PVT-X, Enthalpy
COP
Pressure: 1kPa~2.5MPa
Temp.: 200~450K

Author(s): Setterwall,F. Uddholm,H.
Title: Absorptionsvärmepumpar.
Title Eng: Absorption heat pumps.
Source: STU report, No.82-3237, 1983.
Paper No.: E022 Language: Swedish
Reviewer: Sweden Doc.type: Report
Comment: Simulation of AHP-process in one and two stages, with three different working media pairs. Comparison of COP when simūlating the AHP in a swedish concrete industry with a heat demand of 5.9 GWh/year. COP: NH3/H2o 1.57, H2O/LiBr 1.81, H2O/H3PO4 1.83.

Data No.: E022-01
Fluids: AM, WA
Category: Heat_pump, COP

Data No.: E022-02
Fluids: WA, LB
Category: Heat_pump, COP

Data No.: E022-03
Fluids: WA, OPA
Category: Heat_pump, COP

Author(s): Sjöstedt,S.
Title: Svensk kylteknik från Japan för fjärrvärme med absorptionsvärmepump.
Title Eng: Swedish cooling technology from Japan for district central heating by absorption heat pump.
Source: VVS & Energi, Vol.5, 1985, p51-53.
Paper No.: E002 Language: Swedish
Reviewer: Sweden Doc.type: Journal
Comment: A short description of the AHP in Trollhattan at the time of installation.

Data No.: E002-01
Fluids: WA, LB
Category: COP

Author(s): Smith,I.E. Carey,C.O.B.
Title: The alkali metal hydroxide/water absorption heat pump.
Source: EUR-10007-EN; Comm. Eur. Communities, (Rep.) EUR (1985); Absorpt. Heat Pumps Congr., P.165-74.
Corp_src: Comm. Eur. communities

Paper No.: D160 Language: English
Reviewer: Japan-H Doc.type: Report; conference
Comment: Developed an alkali metal hydroxide/water system heat pump that absorbs heat from air to perform heating. As a concrete example, an absorption cycle with working fluid made by mixing potassium/sodium hydroxide and water was examined. Higher than 1.3 of COP was obtained, and the unit worked under pressure lower than atomospheric pressure. Furthermore, obtained an outlook that higher than 60℃ of heat may be delivered. Thus, the alkali metal hydroxide/water system seems to deserve that it be examined as an working fluid.

Data No.: D160-01
Fluids: WA, PH, SH
Category: Heat_pump, COP

Author(s): Steimle,F.
Title: ABSORPTION HEAT PUMPS-STATUS AND PROSPECTS.
Source: Practice and economic efficiency of modern gas technologies. Praxis und Wirtschaftlichkeit moderner Gastechnologien. Essen, Germany, F.R.: Vulkan Verl. 1983. pp.91-95 Conference: International meeting
Paper No.: D164 Language: German
Reviewer: Germany Doc.type: Bool Article; Conference

Author(s): Stephan,K. Seher,D.
Title: Heat transformer cycles. -2. Thermodynamic analysis and optimization of a single-stage absorption heat transformer.
Source: J. Heat Recovery Systems, Vol.4, No.5, P.371-5, 1984.
Paper No.: D166 Language: English
Reviewer: Germany Doc.type: Journal

Data No.: D166-01
Fluids: AM, WA
Category: Heat_pump, COP

Author(s): Takada,S.
Title: 新しい吸収ヒートポンプの提案
Title Eng: A proposal of new absorption heat pumps.
Source: ヒートポンプ新分野への応用シンポジウム; Symposium on Application of Heat Pumps to New Fields, JAR, p.167, 1983.
Paper No.: D216 Language: Japanese
Reviewer: Japan-I Doc.type: Conference
Comment: Proposed and introduced (1) a double effect systemized high temperature absorption heat pump, (2) a type 2 absorption heat pump that produces chilled water simultaneously, and (3) combination of an engine heat pump and a waste heat absorption heat pump.

Data No.: D216-01
Fluids:
Category: Heat_pump

Author(s): Takeshita,I. Yamamoto,Y. Harada,T.
Wakamatsu,N.
Title: Residential gas-fired absorption heat pump based on R22-DEGDME pair. Part 2, design, computer simulation and testing of a prototype.
Source: Int. J. Refrig., Vol.7, No.5, 1984, p313-321.
Paper No.: D273 Language: English
Reviewer: Doc.type: Journal

Author(s): Takigawa,T. Nakanishi,M. Iyoki,S.
Uemura,T.
Title: H2O-LiBr-LiCl-ZnCl2 系吸収冷凍機及び吸収ヒートポンプの性能と動作特性について
Title Eng: Performance and operating characteristics of the H2O-LiBr-LiCl-ZnCl2 absorption refrigerating machine and heat pump.
Source: 日本冷凍協会学術講演会論文集; Proc. JAR Annual Conf., 1986, p17-20.
Paper No.: D244 Language: Japanese
Reviewer: Doc.type: Conference

Author(s): Thomas,M.D. Turbet,M.C. Dreuilhe,M.J.
Tillequin,M.J. Bugarel,M.R.
Title: Présentation D'Une Boucle Prototype de pompe à Chaleur à Absorption Haute Température Industrielle De 100kW.
Title Eng: Presentation of a prototype system of high temperature absorption industrial heat pump of 100kW.
Source: Association Technique de L'Industrie De Gaz en France, Report No. M-461, 1983.
Paper No.: E038 Language:
Reviewer: Belgium Doc.type:
Comment: Only design parameters and performance values are given for a 100 kW experimental loop.

Data No.: E038-01
Fluids: WA, LB
Category: Heat_pump, COP
Temp.: evaporator inlet water: 107 C, absorber temp: 120 C.

Author(s): Turbet,C.
Title: Pompes à Chaleur à Absorption à Usage Industriel.
Title Eng: Absorption heat pump for industrial use.
Source: Proc. Int. Gas Research Conf., L.H.Hirsh and M.D.Rockville (eds.), 1983, p.932-942, London.
Paper No.: E039 Language: French
Reviewer: Belgium Doc.type: Conference proceedings
Comment: Very little relevant information contained in this paper.

Data No.: E039-01
Fluids: WA, LB
Category: Heat_pump, COP
Temp.: absorber: 140 C.

Author(s): Usui,S. Ouchi,T. Asai,S.
Ishihane,K. Fukuda,T.
Title: 空気熱源フロン吸収式冷暖房機の研究(第一報 冷房サイクルの特性)

Title Eng: A study on air-sourced absorption cooling and heating machines. Part 1: characteristics of the cooling cycle.
Source: 第16回空気調和・冷凍連合講演会講演論文集; Proc. 16th Air-Cond. Refrig. Conf. Japan, 1982, p113-116.
Paper No.: D253 Language: Japanese
Reviewer: Doc.type: Conference

Author(s): Voigt,H.
Title: HEAT PUMPING AND TRANSFORMING PROCESSES WITH INTRINSIC STORAGE.
Source: Energy Convers. Manage., 1985, vol.25(3), p.381-386, CODEN: ECMADL, ISSN: 0196-8904.
Paper No.: D172 Language: English
Reviewer: Japan-D Doc.type: Journal

Data No.: D172-01
Fluids: AM, WA
Category: Heat_pump, COP
Others
Temp.: Single stage:0℃(evaporator), 50～80℃(absorber,output); Double stage:-20℃(evaporator), 50～80℃(absorber,output)
Conc.: 25%(weak solution)

Author(s): Wakamatsu,N. Takeshita,I. Harada,T. Yamada,Y. Inami,T.
Title: R22-ジエチレングリコールジメチルエーテルを用いた家庭用ガス焚き吸収式冷暖房機の研究(2 試作機による実験)
Title Eng: Residential gas-fired absorption heat pumps based on R22-DMEDEG pair. Part 2: testing of a prototype.
Source: 第17回空気調和・冷凍連合講演会講演論文集; Proc. 17th Air-Cond. Refrig. Conf. Japan, 1983, p136-139.
Paper No.: D256 Language: Japanese
Reviewer: Doc.type: Conference

Author(s): Westermark,M.
Title: Heat pumping process based on the principle of absorption.
Source: Eur. Pat. Appl., 122359, Oct. 1984 (Sweden)
Corp_src: Scandiaconsult AB
Paper No.: D175 Language: English
Reviewer: Sweden Doc.type: Patent
Comment: The patent comprises the use of phosphonic acid in AHPs, especially orthophoshoric acid. The acid might additionally comprise corrosion inhibitors and/or boiling elevating agents. The concentration is between 70 - 100%.

Data No.: D175-01
Fluids: WA, OPA
Category: PVT-X, Heat_pump
COP

Author(s): Westermark,M. Blomqvist,R.
Title: Absorptionsvärmepump i fjärrvärmesystem.
Title Eng: Absorption heat pump in a district heating system.
Source: Report R74, 1984.
Corp_src: BFR (Swedish Council of Building Research).
Paper No.: E014 Language: Swedish
Reviewer: Sweden Doc.type: Report

Comment: The premises for an AHP in the distinct heating system in Trollhattan were investigated. The result served as a decisions ground, when the AHP was installed 1985. The economical and technical promises were good.

Data No.: E014-01
Fluids: WA, LB
Category: COP

Author(s): Westermark,M.
Title: Absorptionsvärmepump för utvinning av rökgasspillvärme vid avfallsförbränning.
Title Eng: Absorption heat pump for utilization of waste heat in smoke at water refinery works.
Source: Report R58, 1985.
Corp_src: BFR (Swedish Council of Building Research).
Paper No.: E013 Language: Swedish
Reviewer: Sweden Doc.type: Report
Comment: Discusses technical, economical and environmental views of recovery waste heat from disposed unit steam. The investment cost is 8.2 million SKr at a heat load of 20 MW and a recovered heat of 6.7 MW. Pay-off time less than 2 years.

Author(s): Wimby,M. Franck,P-Å. Berntsson,T.
Title: Utvärdering av absorptionsvärmepumpen i Trollhättan.
Title Eng: Valuation of the absorption heat pump at Trollhattan.
Source: VVS & Energi, Vol.9, 1986, p80-81.
Corp_src: Föolags AB VVS.
Paper No.: E001 Language: Swedish
Reviewer: Sweden Doc.type: Journal
Comment: Description and evaluation of the first large absorption heat pump in Sweden. The AHP delivers 7 MW heat to a distinct heating system, using excess steam as drive energy and cooling water as heat source. The COP varies between 1.3 and 1.8, average 1.65.

Data No.: E001-01
Fluids: WA, LB
Category: Heat_pump

Author(s): Yamamoto,Y. Takeshita,I. Wakamatsu,N. Harada,T.
Title: R22-ジエチレングリコールジメチルエーテルを用いた家庭用ガス焚き吸収式冷暖房機の研究（3　システムシミュレーション）
Title Eng: Residential gas-fired absorption heat pumps based on R22-DMEDEG pair. Part 3: computer simulation.
Source: 第17回空気調和・冷凍連合講演会講演論文集; Proc. 17th Air-Cond. Refrig. Conf. Japan, 1983, p140-143.
Paper No.: D257 Language: Japanese
Reviewer: Doc.type: Conference

Author(s): Ziegler,F. Brandl,F. Voelkl,J. Alefeld,G.
Title: A cascading two-stage sorption chiller system consisting of a water- zeolite high temperature stage and a water-lithium

bromide low- temperature stage.
Source: EUR-10007-EN; Comm. Eur. Communities, (Rep.) EUR (1985); Absorpt. Heat Pumps Congr., P.231-8.
Corp_src: Comm. Eur. Communities
Paper No.: D180 Language: English
Reviewer: Japan-H Doc.type: Report; Comference
Comment: An intermittently operating water-zeolite absorption cycle is used at a high temperature stage, and a water- LiBr cycle is used at the low temperature stage. The COP at the experimental stage of this system is about 1.25 which is comparable to the water-LiBr double-effect system. However, it is expected that temperature higher than that obtained by the double-effect system may be realized.

Data No.: D180-01
Fluids: WA, Z1, LB
Category: Heat_pump, COP
Temp.: high temp. stage: water-zeolite cycle, 250~ 300℃(generator); low temp. stage: water-LiBr cycle, 80~ 100℃(generator)

Author(s): Ziegler,F. Alefeld,G.
Title: Coefficient of performance of multistage absorption cycles.
Source: Int. J. Refrig., Vol.10(5), 1987, p.285-295.
Paper No.: D181 Language: English
Reviewer: Japan-H Doc.type: Journal
Comment: Devised a method that can simply calculate a new-type absorption cycle's efficiency, if the efficiency of a single-stage heat pump or heat transformer is already known. According to it, various types of cycle and working fluid can be compared in efficiency. This literature is informative.

Data No.: D181-01
Fluids: WA, LB
Category: Heat_pump, Refrigerating_machine
COP

Data No.: D181-02
Fluids: AM, WA
Category: Heat_pump, Refrigerating_machine
COP