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ABSORPTION FLUIDS DATA SURVEY: FINAL REPORT ON WORLDWIDE DATA

R. A. Macriss
J. M. Gutraj
T. S. Zawacki

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Chicago, Illinois 60616

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SUMMARY OF RESULTS

Over 500 different worldwide publications containing data relating to properties of binary, ternary, and multicomponent absorption fluids were identified. Of these, over 150 manuscripts include applications of absorption fluid properties data toward evaluation, assessment, or design of chillers or heat pumps but do not include actual fluid properties data. Of the remaining 350 manuscripts, data have been extracted and catalogued from 278 manuscripts with relevant primary source data. The publications date as far back as 1901, but nearly 90% of the documents were published between 1960 and 1987. The texts of the 278 manuscripts are in English, German, Japanese, Russian, or French.

The absorption fluids covered in the 278 documents are combinations of 38 different "refrigerant" compounds and 131 single, 42 binary and 14 ternary "absorbent" compounds. Generally, the 38 refrigerants are divided among the following categories of chemical compounds:

Refrigerants

Inorganic	3
Organic	35
• Amines	4
• Alcohols	5
• Halogenated	25
• Hydrocarbons	1

The single absorbent compounds are generally subdivided as follows:

Absorbents

Inorganic	48
Organic	83
• Alcohols	10
• Ethers	5
• Alcohol-ethers	3
• Amides	9
• Amines	4
• Amine-alcohols	1
• Esters	21
• Ketones	5
• Acids	4
• Aldehydes	1
• Others	20

The binary and ternary absorbents are various mixtures of two or more single absorbent compounds.

In terms of absorption fluid properties, for which data are available in the 278 primary documents, the list below reveals that vapor-liquid equilibrium is the predominant property, reported in almost 60% of the documents. Toxicity or flammability of fluids, on the other hand, is reported in only two documents.

Thermodynamic, transport, and other data

Fluid property	Number of references*
Vapor-liquid equilibrium	180
Enthalpy	74
Specific heat	54
Viscosity	47
Heat of mixing	52
Density	53
Crystallization	52
Surface tension	18
Corrosion (and inhibitors)	25
Thermal conductivity	10
Entropy	16
Stability	9
Refractive index	7
Heat transfer	5
Mass transfer	10
Toxicity	1
Flammability	1

A list of several key absorption fluids currently of interest to researchers of advanced absorption heat pumps is also shown below:

Key fluids
(see Table 5 for abbreviations)

NH_3-H_2O	CH_3OH-LiBr-$ZnBr_2$
NH_3-H_2O-LiBr	TFE-NMP
NH_3-H_2O-$LiNO_3$	TFE-DMEDEG

* A given document may contain data relating to more than one property; therefore, the sum of the references is larger than 199.

NH_3-NaSCN	TFE-DMETEG
H_2O-LiBr	CH_3NH_2-H_2O-LiBr
H_2O-LiBr-LiCl	R21-DMETEG
H_2O-LiBr-LiSCN	R22-DMEDEG
H_2O-LiBr-$ZnBr_2$	R22-DMETEG
H_2O-NaOH-KOH-CsOH	R22-DMF
H_2O-$LiNO_3$-$NaNO_3$-KNO_3	R123a-ETFE
CH_3OH-LiBr	R124-ETFE
CH_3OH-$ZnBr_2$	R133a-NMP

Coarse screening and evaluations were carried out as part of this study for selected or key absorption fluids. Several approaches were considered for the review and coarse screening of data from multiple sources. These include

- Consideration of the author's statements concerning data quality;
- Assessment of the measurement technique and apparatus used to develop the data;
- Consideration of a given author's reputation for measuring data, where only one author's data were available for a fluid;
- Comparison of data plots for a given fluid using data scatter and internal consistency criteria to judge data quality and multiple-author data agreement; and
- Consideration of general trends of the plotted data as inferred from data for similar or homologous series fluids.

The coarse screening addressed data from multiple sources for several different fluid systems (NH_3-H_2O, H_2O-LiBr, CH_3OH-$ZnBr_2$, CH_3OH-LiBr, R22-DMETEG), covering several properties. The number of alternate data sources varied from 2 to 4, and the 5 fluids shown in parenthesis are the only ones with data from multiple sources abstracted to date.

Data gaps for key fluids have been summarized. Unresolved or potential conflicts in the data, lack of data for known key fluids at conditions beyond the limits of present data, and new fluids without property data constitute these summaries. A prioritized system to fill such gaps on a fluid-by-fluid and property-by-property basis was devised for quick reference.

With very few exceptions, and with emphasis on current development activities dealing with advanced absorption heat pump concepts, almost all candidate fluids have data gaps that need to be addressed in the near future.

ABSTRACT

Over 500 different worldwide publications containing data that relate to properties of binary, ternary, and multicomponent absorption fluids have been identified; from these publications, 278 were selected as primary sources of relevant data. Fluids covered include combinations of 38 different refrigerant compounds, as well as of 131 single, 42 binary, and 14 ternary absorbent compounds. Generally, the 38 refrigerants are divided among the following categories of chemical compounds: inorganic, 3; organic, 35 (amines, 4; alcohols, 5; halogenated, 25; and hydrocarbons, 1). The single absorbent compounds generally are subdivided as follows: inorganic, 48; organic, 83 (alcohols, 10; ethers, 5; alcohol-ethers, 3; amides, 9; amines, 4; amine-alcohols, 1; esters, 21; ketones, 5; acids, 4; aldehydes, 1; and others, 20). The binary and ternary absorbents are various mixtures of two or more single absorbent compounds. Coarse screening and evaluations were performed. Data gaps for key fluids are summarized and unresolved conflicts in data are noted. Results show that, with very few exceptions, all candidate fluids for development activities dealing with advanced absorption heat pump concepts have data gaps that must be addressed in the near future.

1. INTRODUCTION

Over the past 86 years, a wealth of physical and thermodynamic property data has been developed for fluid systems that are potentially applicable to the absorption refrigeration/heat pump cycle. A significant portion of the data is available in the literature, some data remain confined to in-house files for various reasons, and other data are proprietary but could be made available under certain conditions or terms.

Generally, published data have been generated in areas of temperature, pressure, and composition of interest to designers of absorption chillers or coolers. Recent research has focused on developing efficient cycle configurations, using multieffect or multistage concepts, for both space heating and cooling. These new designs operate at temperatures and pressures significantly higher than those encountered in the conventional absorption cooling cycle. Other new concepts are based on the addition of a third component to the binary solutions normally used in the conventional cycle.

In an effort to define the availability and quality of existing data and thereby to assist in the determination of needs for new data useful to advanced concepts, the Institute of Gas Technology (IGT) has performed an extensive literature search and a coarse screening of existing U.S. and foreign literature data to identify potential conflicts or gaps in the data for certain key fluid systems. This report provides a detailed account of IGT's findings.

The information and data contained in this report are presented in a format utilized in two earlier reports (ORNL/SUB/84-4798/1 and ORNL/SUB/84-4798/2) that covered, in part, similar data developed in the United States and abroad over the past 86 years.

2. METHOD AND SCOPE

Literature searches and site visits were undertaken to identify and obtain available publications — several dating back to 1901 — on pertinent physical, thermodynamic, and transport properties of absorption fluids. The bulk of references identified contain data developed mainly in the United States, West Germany, France, Britain, Japan, and the USSR. Cross-checks of literature searches were also made, using available published bibliographies and literature review articles, to eliminate secondary sources for the data and thus include only original sources and manuscripts.

2.1. FLUID PROPERTIES AND DATA

The properties of these fluids relate to the liquid and/or vapor state encountered in normal operation of absorption equipment employing such fluids, and to the crystallization boundary of the liquid phase, where applicable. The actual data were systematically classified according to type of fluid and property as well as to temperature, pressure, and concentration ranges over which data were available. Data were sought for at least 17 different properties, as follows:

Mixture properties

1. Vapor-liquid equilibria
2. Crystallization temperature
3. Corrosion characteristics
4. Heat of mixing
5. Liquid-phase densities
6. Vapor-liquid-phase enthalpies
7. Specific heat
8. Stability
9. Viscosity
10. Mass transfer rate
11. Heat transfer rate
12. Thermal conductivity
13. Refractive index
14. Entropy
15. Surface tension
16. Toxicity
17. Flammability

The type of available data was of importance, with raw experimental data considered to be highly desirable for use in actual process and equipment design and sizing and for process design correlation development. For this reason, raw tabulated experimental data were given the highest possible ranking, with other forms of data following in importance, as shown below:

Form of data	Symbol
Raw experimental	(E)
• Tabular	(T)
• Graphical	(G)
Smoothed experimental	(S)
• Tabular	(T)
• Graphical	(G)
Empirical polynomial	(P)
Equations of state	(C)

Empirical polynomial relationships based on raw or smoothed experimental data are often reported. Such correlations are at best as good as the experimental data and can help facilitate the use of the data in performance and design calculations through automation (computer software and terminals). In the absence of data, reliable methods of prediction have been sought (equations of state, generalized correlations) but are expected to possess greater uncertainties than the previous forms of data.

2.2. COARSE SCREENING OF LITERATURE DATA

Several approaches have been used in carrying out quality review and coarse screening of data from multiple sources for each of several key or highest-priority binary fluids. These alternative approaches include

- Consideration of the author's statements concerning data quality;
- Assessment of the measurement technique and apparatus used in obtaining the data; and
- Consideration of a given author's reputation for measuring data, where only one author's data were available for a fluid.

A more reliable method used to compare data from various sources for a given fluid and property has been the plotting of data on a common basis. Such plots have also served to reveal the amount of scatter or internal consistency of a given author's data and, therefore, its quality. Another approach was based on consideration of general trends of the plotted data, as inferred from data for similar or homologous series fluids.

3. DETAILED PRESENTATIONS AND TABULATIONS

As previously implied, this report was organized to cover the various work elements of this study in their natural sequence. This portion of the report contains a listing of the refrigerants and absorbents of the absorption fluids of this study, the results of the coarse and fine screening of data for key fluids, a list of gaps in the data of the key fluids, and the reference material accumulated. The details of the range of conditions over which property data exist for each fluid are given in the Appendix.

3.1. REFRIGERANTS AND ABSORBENTS

Table 1 lists the 38 refrigerants grouped into 5 distinct chemical compound categories: inorganics, amines, alcohols, halogenated organics, and hydrocarbons. For each refrigerant, Table 1 contains a compound number, chemical formula and name, molecular weight, and normal boiling point (in dual units).

Table 2 lists 48 single inorganic absorbents and a number, chemical formula, name, and molecular weight for each. Table 3 lists 83 single organic absorbents grouped into 9 distinct chemical compound categories: alcohols, ethers, alcohol-ethers, amides, amines, amine-alcohols, esters, ketones, acids, aldehydes, and an undefined catch-all category. For each organic absorbent, Table 3 contains a compound number, an arbitrary abbreviation of convenience, chemical formula and name, molecular weight, and normal boiling point (individual units).

Table 4 lists 56 multicomponent (binary and ternary) absorbents with access number and chemical formula. Table 5 is an alphabetical listing of the arbitrary abbreviations keyed to the chemical name of the organic compounds.

Table 1. Refrigerants

Number	Chemical formula	Name	MW	NBP (°F)	NBP (°C)
Inorganics					
1	NH_3	Ammonia	17.0	-28	-33.3
2	H_2O	Water	18.0	212	100.0
3	SO_2	Sulfur dioxide	64.1	14	-10.0
Amines					
4	CH_3NH_2	Methylamine	31.1	21	-6.1
5	$C_2H_5NH_2$	Ethylamine	45.1	62	16.6
6	$(CH_3)_2NH$	Dimethylamine	45.1	45	7.4
7	$(CH_3)_3N$	Trimethylamine	59.1	38	3.5
Alcohols					
8	CH_3OH	Methanol	32.0	149	65.0
9	C_2H_5OH	Ethanol	46.1	173	78.3
10	C_3H_7OH	n-Propanol	60.1	207	97.2
11	CF_3CH_2OH	Trifluoroethanol	100.0	164	73.6
12	$(CF_3)_2CHOH$	Hexafluoroisopropanol	168.0	138	59.0
Halogenated organics					
13	CCl_3F	Refrigerant 11	137.4	75	23.9
14	CCl_2F_2	Refrigerant 12	120.9	-21	-29.4
15	CF_3Cl	Refrigerant 13	104.5	-81	-113.8
16	$CHFCl_2$	Refrigerant 21	102.9	48	8.9
17	CHF_2Cl	Refrigerant 22	86.5	-41	-40.6
18	CH_2Cl_2	Refrigerant 30	84.9	104	40.0
19	CH_2ClF	Refrigerant 31	68.5	16	-8.9
20	CF_3CHCl_2	Refrigerant 123	152.9	82	27.8
21	$CHClFCClF_2$	Refrigerant 123a	152.9	85	29.4
22	$CHClFCF_3$	Refrigerant 124	136.5	10	-12.1
23	CHF_2CClF_2	Refrigerant 124a	136.5	15	-9.4
24	$CHCl_2CHClF$	Refrigerant 131a	151.4	185	85.0
25	CHF_2CHClF	Refrigerant 133a	118.5	42	5.6

Table 1. (cont.)

Number	Chemical formula	Name	MW	NBP (°F)	NBP (°C)
26	CHF_2CHF_2	Refrigerant 134	102.0	49	94.0
27	CCl_2HCClH_2	Refrigerant 140a	133.4	235	112.8
28	CH_3CF_3	Refrigerant 143a	84.0	-53	-47.0
29	CH_2FCH_2F	Refrigerant 152	66.0	86	30.0
30	CHClCHCl	Refrigerant 1130	96.9	138	58.9
31	CClFCClF	Refrigerant 1112a	132.4	66	18.9
32	CCl_2CClH	Refrigerant 1120	131.4	180	82.2
33	C_2F_3H	Refrigerant 1123	82.0	ND	ND
34	C_2F_3Cl	Refrigerant 1113	116.5	-18	-27.9
35	C_3F_6	Refrigerant 216	150.0	-21	-29.4
36	CH_3CF_2Cl	Refrigerant 142	100.6	ND	ND
37	C_3HF_5O	Pentafluoropropionic acid	164.0	232	97.0
Hydrocarbons					
38	$CH_3(CH_2)_4CH_3$	Hexane	86.0	154	68.0

ND - Not determined.

Table 2. Absorbents (inorganic)

Number	Chemical formula	Name	MW
1	NH_4Br	Ammonium bromide	98.0
2	NH_4I	Ammonium iodide	144.9
3	$CaBr_2$	Calcium bromide	199.9
4	$CaCl_2$	Calcium chloride	111.0
5	$CsC_2H_3O_2$	Cesium acetate	192.0
6	CsBr	Cesium bromide	212.8
7	CsCl	Cesium chloride	168.4
8	CsF	Cesium fluoride	151.9
9	CsOH	Cesium hydroxide	149.9
10	$Co(SCN)_2$	Cobalt thiocyanate	175.1
11	$Cu(SCN)_2$	Cupric thiocyanate	179.7
12	CuSCN	Cuprous thiocyanate	121.6
13	$LiC_2H_3O_2$	Lithium acetate	66.0
14	LiBr	Lithium bromide	86.8
15	$LiClO_3$	Lithium chlorate	90.4
16	LiCl	Lithium chloride	42.4
17	LiH_2PO_3	Lithium hydrogen phosphite	96.1
18	LiI	Lithium iodide	133.8
19	$LiNO_3$	Lithium nitrate	68.9
20	$LiNO_2$	Lithium nitrite	52.9
21	Li_2SO_4	Lithium sulfate	109.9
22	$LiBF_4$	Lithium tetrafluoroborate	93.7
23	LiSCN	Lithium thiocyanate	65.0
24	$LiCCl_3CO_2$	Lithium trichloroacetate	169.3
25	$LiCF_3CO_2$	Lithium trifluoroacetate	112.0
26	$Ni(SCN)_x$	Nickel thiocyanate	ND
27	KBr	Potassium bromide	119.0
28	KCl	Potassium chloride	74.6
29	KF	Potassium fluoride	58.1
30	KOH	Potassium hydroxide	56.1
31	KNO_3	Potassium nitrate	101.1

Table 2. (cont.)

Number	Chemical formula	Name	MW
32	RbBr	Rubidium bromide	165.4
33	RbCl	Rubidium chloride	120.9
34	RbF	Rubidium fluoride	104.5
35	RbI	Rubidium iodide	212.4
36	NaBr	Sodium bromide	102.9
37	NaCl	Sodium chloride	58.4
38	NaOH	Sodium hydroxide	40.0
39	NaI	Sodium iodide	149.9
40	$NaNO_3$	Sodium nitrate	85.0
41	Na_2SO_4	Sodium sulfate	142.0
42	NaSCN	Sodium thiocyanate	81.1
43	H_2SO_4	Sulfuric acid	98.0
44	H_2O	Water	18.0
45	$ZnBr_2$	Zinc bromide	225.2
46	$ZnCl_2$	Zinc chloride	136.3
47	$Zn(NO_3)_2$	Zinc nitrate	127.4
48	$Zn(SCN)_2$	Zinc thiocyanate	181.5

Table 3. Absorbents (organic)

No.	Abbrev.	Chemical formula	Name	MW	NBP (°F)	NBI (°C)
Alcohols						
49	1,4 BDL	HOC_4H_8OH	1, 4-Butanediol	90.1	455	235.
50	2,3 BDL	$CH_3CHOHCHOHCH_3$	2, 3-Butanediol	90.1	358	181.
51	EG	HOC_2H_4OH	Ethylene glycol	62.1	388	197.
52	DEG	$(HOCH_2CH_2)_2O$	Diethylene glycol			
53	TEG	$H(OC_2H_4)_4OH$	Tetraethylene glycol	194.2	622	327.[illegible]
54	n-HA	$n\text{-}C_7H_{15}OH$	n-Heptyl alcohol	116.2	349	176.[illegible]
55	BA	$C_6H_5CH_2OH$	Benzyl alcohol	108.2	402	205.[illegible]
56	GYL	$CH_2OHCHOHCH_2OH$	Glycerol	92.1	554	290.[illegible]
57	PD	$HOCH_2(CH_2)_3CH_2OH$	Pentanediol	104.2	463	239.4
58	HDL	$HOCH_2(CH_2)_4CH_2OH$	Hexanediol	118.2	482	250.0
Ethers						
59	DMEDEG	$CH_3(OC_2H_4)_2OCH_3$	Dimethylether diethylene glycol	134.2	324	162.2
60	DMETrEG	$CH_3(OC_2H_4)_3OCH_3$	Dimethylether triethylene glycol	178.2	421	216.1
61	DMETEG	$CH_3(OC_2H_4)_4OCH_3$	Dimethylether tetraethylene glycol	222.3	528	275.6
62	ETFE	$(C_4H_7O)CH_2OC_2H_5$	Ethyl tetrahydro furfuryl ether	130.2	316	157.8
63	DBC	$C_4H_9(OC_2H_4)_2OC_4H_9$	Dibutyl carbitol	218.3	ND	ND
Alcohol-ethers						
64	MBEDEG	$HO(CH_2)_2O(CH_2)_2OC_4H_9$	Monobutylether diethylene glycol	162.2	448	231.0
65	MEDEG	$H(OC_2H_4)_2OC_2H_5$	Monoethylether diethylene glycol	134.2	383	195.0
66	METrPG	$C_2H_5(OC_3H_6)_3OH$	Monomethylether of tripropylene glycol	220.3	ND	ND
Amides						
67	DMF	$CHON(CH_3)_2$	N, N - Dimethyl formamide	73.1	302	150.0
68	DMA	$CH_3CON(CH_3)_2$	N, N - Dimethyl acetamide	87.1	329	165.0
69	DMH	$C_5H_{11}CON(CH_3)_2$	N, N - Dimethyl hexanamide	143.2	428	220.0
70	DMD	$C_{11}H_{23}CON(CH_3)_2$	N, N - Dimethyl dodecanamide	217.3	ND	ND
71	DEF	$CHON(C_2H_5)_2$	N, N - Diethyl formamide	101.2	351	172.2
72	TMM	$[(CH_3)_2NCOCH_2CONCOH_3]_2$	N, N, N, N - Tetramethylmalonamide	158.2	ND	ND

Table 3. (cont.)

No.	Abbrev.	Chemical formula	Name	MW	NBP (°F)	NBP (°C)
73	TMS	$[(CH_3)_2NCOCH_2]_2$	N, N, N, N - Tetramethylsuccinamide	172.2	ND	ND
74	DMAN	$C_6H_5N(CH_3)_2$	N, N - Dimethyl aniline	121.2	381	193.9
75	HMPT	$[(CH_3)_2N]_3PO$	Hexamethylphosphoric acid triamide	179.2	ND	ND
Amines						
76	QUN	C_9H_7N	Quinoline	129.2	465	240.5
77	MCAN	$C_6H_5CLNH_2$	M-Chloro aniline	127.6	446	230.0
78	AN	$C_6H_5NH_2$	Aniline	93.1	363	183.9
79	OCA	$C_8H_{17}NH_2$	Octylamine	129.3	359	181.7
Amine-alcohol						
80	MEA	$H_2NCH_2CH_2OH$	Ethanolamine	61.1	338	170.0
Esters						
81	IBA	$CH_3CO_2CH_2CH(CH_3)_2$	Isobutyl acetate	116.1	244	118.0
82	DMPH	$C_6H_4(CO_2CH_3)_2$	Dimethyl phthalate	194.2	540	282.0
83	DET	$C_6H_4(CO_2C_2H_5)_2$	Diethyl phthalate	222.2	576	302.0
84	DBP	$C_6H_4(CO_2C_4H_9)_2$	Dibutyl phthalate	278.3	644	340.0
85	DOP	$C_6H_4(CO_2C_8H_{17})_2$	Dioctyl phthalate	390.4	ND	ND
86	DDP	$C_6H_4(CO_2C_{10}H_{21})_2$	Didecyl phthalate	446.3	ND	ND
87	DCP	$C_6H_4(CO_2C_6H_{13})_2$	Dicapryl phthalate	334.3	ND	ND
88	DBS	$[(CH_2)_4CO_2C_4H_9]_2$	Dibutyl sebacate	314.4	651	344.0
89	DOS	$C_8H_{17}O_2C(CH_2)_8CO_2C_8H_{17}$	Dioctyl sebacate	426.7	ND	ND
90	TAN	$CH_3CO_2CH(CH_2O_2CCH_3)_2$	Triacetin	218.2	498	258.9
91	ETL	$CH_3(CH_2)_{10}CO_2C_2H_5$	Ethyl laurate	222.4	523	272.8
92	DEO	$C_2H_5O_2CCO_2C_2H_5$	Diethyl oxalate	146.1	366	185.6
93	DEAP	$C_2H_5O_2C(C_2H_4)_4CO_2C_2H_5$	Diethyl adipate	202.2	473	245.0
94	DEM	$CH_2(CO_2C_2H_5)_2$	Diethyl malonate	160.2	391	199.4
95	MB	$C_6H_5CO_2CH_3$	Methyl benzoate	136.1	384	195.5
96	EB	$C_6H_5CO_2C_2H_5$	Ethyl benzoate	150.2	415	212.8
97	PB	$C_6H_5CO_2C_3H_7$	Propyl benzoate	164.2	448	195.5
98	n-BB	$C_6H_5CO_2C_4H_9$	n-Butyl benzoate	178.2	483	250.6

Table 3. (cont.)

No.	Abbrev.	Chemical formula	Name	MW	NBP (°F)	N (°
99	TBP	$(C_4H_9O)_3PO$	Tri-butyl phosphate	266.3	552	28
100	MSA	$C_6H_4(OH)CO_2CH_3$	Methyl salicylate	152.2	452	23
101	BZA	$C_6H_5(CH_2CO_2CH_3)$	Benzyl acetate	150.2	420	21
Ketones						
102	4, BLN	$(CH_2)_3CO_2$	4-Butyrolactone	86.1	403	20(
103	NMP	C_5H_9NO	N-Methyl-2-pyrrolidone	99.1	394	201
104	2-(OCN)	$C_8H_{16}O$	2-Octanone	128.2	343	172
105	2,4 PON	$CH_3COCH_2COCH_3$	2-4 pentanedione	100.1	282	138
106	APN	$C_6H_5COCH_3$	Acetophenone	120.2	396	202
Acids						
107	PPA	CH_3CH_2COOH	Propionic acid	74.1	287	141
108	LLA	$C_{18}H_{32}O_2$	Linoleic acid	280.5	ND	ND
109	OA	$C_{18}H_{34}O_2$	Oleic acid	282.5	689	365
110	VA	$C_5H_{10}O_2$	Valeric acid	102.1	367	186
Aldehydes						
111	BAD	C_7H_6O	Benzaldehyde	106.1	353	178.
Others						
112	TDK	$CH_3(CH_2)_{12}CH_3$	Tetradecane	198.4	252	122.
113	DWA	$(C_6H_5)_2O$	Dowtherm A	170.2	446	257.
114	BZL	C_7H_5NS	Benzothiazole	135.2	448	231.
115	DMMP	$CH_3PO(OCH_3)_2$	Dimethyl methyl phosphonate	124.1	175	79.
116	DMSO	$(CH_3)_2SO$	Dimethyl sulfoxide	78.1	372	189.
117	NB	$C_6H_5NO_2$	Nitrobenzene	123.1	411	210.
118	PDS	ND	Polydimethylsiloxane	ND	ND	ND
119	OC	$C_9H_{17}N$	Octyl cyanide	139.2	436	224.
120	MM	$C_5H_{11}NO$	N-Methylmorpholine	101.2	241	116.
121	LBS	$C_6H_5SO_3Li$	Lithium benzenesulfonate	164.1	ND	ND
122	UTN	$C_6H_{12}N_4$	Utropin	140.0	ND	ND

Table 3. (cont.)

	Abbrev.	Chemical formula	Name	MW	NBP (°F)	NBP (°C)
3	DMEU	$C_5H_{10}N_2O$	1,3 Dimethyl-2-imidazolidinone "Dimethylethylenurea"	114.2	433	223.0
4	DMPU	$C_6H_{12}N_2O$	1,3 Dimethyl-3,4,5,6 tetrahydro-2 (1H)-pyrimidinone "Dimethylpropylenurea"	128.2	450	232.0
5	NMC	$C_7H_{13}NO$	N-Methyl-E-caprolactam	101.1	ND	ND
6	NFM	$C_5H_9NO_2$	N-Formylmorpholine	115.1	471	244.0
7	EC	$C_3H_4O_3$	Ethylcarbonate	88.1	460	238.0
8	PC	$C_4H_7O_3$	Propylenecarbonate	102.1	467	241.7
9	SL	$C_4H_8SO_2$	Sulfolane	120.2	549	287.0
0	CUM	$C_9H_8O_2$	Dihydrocoumarin	148.2	522	272.0
1	DCM	$C_{19}H_{26}O_2$	Dicumylmethane	202.3	ND	ND

ND - Not determined.

Table 4. Absorbents (multicomponent)

Binary				Ternary	
No.	Chemical formula	No.	Chemical formula	No.	Chemical formula
Bi-1	LiBr: LiCl	Bi-23	LiI: EG	Te-1	LiBr: $ZnBr_2$: DEG
Bi-2	LiBr: LiSCN	Bi-24	LiI: $ZnBr_2$	Te-2	LiBr: $ZnBr_2$: EG
Bi-3	LiBr: $LiClO_3$	Bi-25	LiSCN: NaSCN	Te-3	LiBr: $ZnBr_2$: DMEDEG
Bi-4	LiBr: CsBr	Bi-26	LiSCN: DMETEG	Te-4	LiBr: $ZnBr_2$: MBEDEG
Bi-5	LiBr: $ZnBr_2$	Bi-27	LiSCN: EG	Te-5	LiBr: $ZnBr_2$: PD
Bi-6	LiBr: MEA	Bi-28	LiSCN: 1, 4 BDL	Te-6	LiBr: LiI: EG
Bi-7	LiBr: EG	Bi-29	LiSCN: MEA	Te-7	LiBr: $ZnBr_2$: $CaBr_2$
Bi-8	LiBr: H_2O	Bi-30	LiSCN: DMF	Te-8	LiBr: CsBr: RbBr
Bi-9	LiBr: 4, BLN	Bi-31	NaSCN: NaI	Te-9	LiBr: RbF: CsF
Bi-10	LiBr: LiI	Bi-32	NaSCN: TEG	Te-10	NaSCN: NaI: 1, 4, BDL
Bi-11	LiBr: $ZnCl_2$	Bi-33	NaSCN: 1, 4 BDL	Te-11	$LiNO_3$: $NaNO_3$: KNO_3
Bi-12	LiCl: LiAcetate	Bi-34	NaI: 1, 4 BDL	Te-12	LiCl: $CaCl_2$: $Zn(NO_3)_2$
Bi-13	LiCl: CsCl	Bi-35	NH_4I: 1, 4 BDL	Te-13	R22: DMETEG: BA
Bi-14	LiCl: $ZnBr_2$	Bi-36	CsF: RbF	Te-14	NaOH: KOH: CsOH
Bi-15	LiCl: $ZnCl_2$	Bi-37	DMETEG: BA		
Bi-16	LiCl: LiSCN	Bi-38	DMETEG: DMF		
Bi-17	LiCl: $CaCl_2$	Bi-39	R22: DMETEG		
Bi-18	$LiNO_3$: H_2O	Bi-40	R22: DMA		
Bi-19	$LiNO_2$: $LiClO_3$	Bi-41	H_2O: CrO_3		
Bi-20	$LiNO_3$: 1,4 BDL	Bi-42	NaOH: KOH		
Bi-21	$LiNO_3$: 1,6 HDL				
Bi-22	$CaBr_2$: $ZnBr_2$				

Table 5. List of arbitrary abbreviations for organic compounds

Abbreviation	No.	Chemical name
AN	78	Aniline
APN	106	Acetophenone
BA	55	Benzyl alcohol
BAD	111	Benzaldehyde
1,4 BDL	49	1, 4-Butanediol
2,3 BDL	50	2, 3-Butanediol
4, BLN	102	4-Butyrolactone
BZA	101	Benzyl acetate
BZL	114	Benzothiazol
CUM	130	Dihydrocoumarin
DBC	63	Dibutyl carbitol
DBP	84	Dibutyl phthalate
DBS	88	Dibutyl sebacate
DCP	87	Dicapryl phthalate
DDP	86	Didecyl phthalate
DEAP	93	Diethyl adipate
DEF	71	N, N-Diethyl formamide
DEG	52	Diethylene glycol
DEM	94	Diethyl malonate
DEO	92	Diethyl oxalate
DET	83	Diethyl phthalate
DCM	131	Dicumylmethane
DMA	68	N, N-Dimethyl acetamide
DMAN	74	N, N-Dimethyl aniline
DMD	70	N, N-Dimethyl dodecanamide
DMEDEG	59	Dimethylether diethylene glycol
DMETEG	61	Dimethylether tetraethylene glycol
DMETrEG	60	Dimethylether triethylene glycol
DMEU	123	Dimethylethylenurea
DMF	67	N, N-Dimethyl formamide
DMH	69	N, N-Dimethyl hexanamide
DMMP	115	Dimethyl methyl phosphonate

Table 5. (cont.)

Abbreviation	No.	Chemical name
DMPH	82	Dimethyl phthalate
DMPU	124	Dimethylpropylenurea
DMSO	116	Dimethyl sulfoxide
DOP	85	Dioctyl phthalate
DOS	89	Dioctyl sebacate
DWA	113	Dowtherm A
EB	96	Ethyl benzoate
EC	127	Ethylenecarbonate
EG	51	Ethylene glycol
ETFE	62	Ethyl tetrahydro furfuryl ether
ETL	91	Ethyl laurate
GLY	56	Glycerol
HDL	58	Hexanediol
HFIP	Refrigerant	Hexafluoroisopropanol
HMPT	75	Hexamethylphosphoric acid triamide
IBA	81	Isobutyl acetate
LBS	121	Lithium benzenesulfonate
LLA	108	Linoleic acid
MB	95	Methyl benzoate
MBEDEG	64	Monobutylether diethylene glycol
MCAN	77	M-Chloro aniline
MEA	80	Monoethanolamine
MEDEG	65	Monoethylether diethylene glycol
METrPG	66	Monomethylether of tripropylene glycol
MM	120	N-Methylmorpholine
MSA	100	Methyl salicylate
n-BB	98	n-Butyl benzoate
n-HA	54	n-Heptyl alcohol
NB	117	Nitrobenzene
NFM	126	N-Formylmorpholine
NMC	125	N-Methyl-E-caprolactam
NMP	103	N-Methyl-2-pyrrolidone

Table 5. (cont.)

Abbreviation	No.	Chemical name
OA	109	Oleic acid
OC	119	Octyl cyanide
OCA	79	Octylamine
2-(OCN)	104	2-Octanone
PB	97	Propyl benzoate
PC	128	Propylenecarbonate
PD	57	Pentanediol
PDS	118	Polydimethylsiloxane
PFPA	Refrigerant	Pentafluoropropionic acid
2, 4 PON	105	2-4 Pentanedione
PPA	107	Propionic acid
QUN	76	Quinoline
SL	129	Sulfolane
TAN	90	Triacetin
TBP	99	Tri-butyl phosphate
TDK	112	Tetradecane
TEG	53	Tetraethylene glycol
TFE	Refrigerant	Trifluoroethanol
TMM	72	N, N, N, N-Tetramethylmalonamide
TMS	73	N, N, N, N-Tetramethylsuccinamide
UTN	122	Utropin
VA	110	Valeric acid

3.2. FLUIDS, PROPERTIES, AND NUMBER OF REFERENCES WITH DATA

For each fluid and property addressed in this study, the availability of data can be quickly and readily assessed in a series of triangular diagrams. In each of these figures, the number of references for each fluid and property with data available is placed in a grid. Blank grids in these charts represent fluid and/or properties for which no data references have been found. Where a large number of references are indicated in the grid for a particular fluid and property of interest, data gaps are expected to be less critical. Where a blank grid appears for a fluid system of high priority, a critical need is suspected.

Fig. 1 lists the fluids and the number of references with vapor-liquid equilibrium data available for each. Fig. 2 lists the fluids and the number of references for each fluid with data on crystallization temperature. Similarly, Fig. 3 lists the number of references for data on corrosion, Fig. 4 for heat of mixing, Fig. 5 for liquid-phase density, Fig. 6 for vapor- and liquid-phase enthalpy, Fig. 7 for specific heat, Fig. 8 for stability, Fig. 9 for viscosity, Fig. 10 for mass and heat transfer rates, thermal conductivity, and refractive index, and Fig. 11 for flammability, toxicity, entropy, and surface tension.

REFRIGERANTS \ ABSORBENTS	ETFE	DMETEG	DMETrEG	DMEDEG	TEG	DMF	DMA	DMH	DMD	H_2O	LiBr	LiCl	LiSCN	$LiNO_3$	$LiClO_3$	NH_4I	NaSCN	$ZnBr_2$	$ZnCl_2$	LiBr: LiCl	LiBr: $ZnBr_2$	LiBr: LiSCN	CsF: RbF
R-123a	1																						
R-133a	3																						
R-124a		1																					
R-134		1																					
R-11		2																					
R-30		1																					
R-31		1																					
R-12		1				1	1																
R-21		6	1	1		4	1	2															
R-22	1	14	3	4		7	2	2															
R-123								1															
R-131a								1															
R-140a									1														
R-1112a								1															
R-1120									1														
R-1130								1	1														
SO_2		1				1	1																
CH_3NH_2		1			2					2			3	1			2						
$(CH_3)_2NH$					1					1													
$(CH_3)_3N$					1																		
C_3H_7OH												1						1	1				
CH_3OH										1	13	2	1					7	1	1	9		
C_2H_5OH										1	3	1						1	1		1		
H_2O		1			1	2					22	4	1	1	1			1	1	4	3	5	1
NH_3		1	1		1		1			32			2	2		2	2						

Fig. 1. Number of references for vapor-liquid equilibrium data.

REFRIGERANTS \ ABSORBENTS	LLA	APN	2,4 PON	NMP	4-BLN	2-OCN	$Cu(SCN)_2$	CuSCN	$Co(SCN)_2$	$Ni(SCN)_x$	NaI	RbF	$Zn(SCN)_2$	$ZnNO_3$	KF	$CsC_2H_3O_2$	CsF	CsBr	CsCl	$LiCl1_3CO_2$	$LiCF_3CO_2$	$LiBF_4$	$LiNO_2$
R-133a																							
R-124a																							
R-134																							
R-11																							
R-30																							
R-31																							
R-12																							
R-21	1	1	1	1																			
R-22	1	1	1	2																			
R-123				1																			
R-131a																							
R-140a																							
R-1112a																							
R-1120																							
R-1130																							
SO_2						1																	
CH_3NH_2							1	1	1	1			1										
$(CH_3)_2NH$																							
$(CH_3)_3N$																							
C_3H_7OH																							
CH_3OH																							
C_2H_5OH																							
H_2O											1			1	1	1	1			1	1	1	1
NH_3											1												

Fig. 1. (continued).

REFRIGERANTS \ ABSORBENTS	DOP	TAN	DOS	n-BB	1,4 BDL	DEM	DEAP	DEO	UTN	MEA	OCA	AN	LiSCN: EG	EG	LiI	NaBr	MEDEG	1,4 BDL: NaSCN	NaSCN: NaI	LiBr: EG	BA	n-HA	2,3 BDL
R-133a																							
R-124a																							
R-134																							
R-11																							
R-30																							
R-31																							
R-12				1																			
R-21		1		1		1	3	2															
R-22	2	3	2	1		1		1															
R-123																							
R-131a																							
R-140a																							
R-1112a																							
R-1120																							
R-1130																							
SO_2																							
CH_3NH_2					2								1	3			1						
$(CH_3)_2NH$																							
$(CH_3)_3N$																							
C_3H_7OH																							
CH_3OH														1									
C_2H_5OH															1								
H_2O									1						3	1				4			
NH_3					1						1	1						1	1				1

Fig. 1. (continued).

REFRIGERANTS \ ABSORBENTS	R-12: BA: DMETEG	R-22: DMA	R-22: DMETEG	DMETEG: DMF	OCA	MM	OC	MCAN	DMF: DBP	LiBr: $ZnBr_2$: $CaBr_2$	LiCl: $ZnCl_2$	LiBr: CsBr	LiCl: CsCl	LiSCN: LiCl	$LiNO_2$: $LiClO_3$	LiCl: $LiC_2H_3O_2$	LiBr: $LiClO_3$	LiH_2PO_3	LBS	PDS	1,4 BDL: NaI: NaSCN	TEG: NaSCN	1,4 BDL: NH_4I	1,4 BDL: NaI
R-133a																								
R-124a																								
R-134																								
R-11																								
R-30																								
R-31																								
R-12	1	1	1																					
R-21				1	1	1	1	1																
R-22									1															
R-123																								
R-131a																								
R-140a																								
R-1112a																								
R-1120																								
R-1130																								
SO_2																								
CH_3NH_2																								
$(CH_3)_2NH$																								
$(CH_3)_3N$																								
C_3H_7OH																								
CH_3OH																								
C_2H_5OH																								
H_2O										1	1	1	1	1	1	1	1	1	1					
NH_3																				1	1	1	1	1

Fig. 1. (continued).

REFRIGERANTS \ ABSORBENTS	DMAN	AN	NB	n-HA	BAD	VA	ETL	OA	METrPG	LiI: EG	$CaBr_2$: $ZnBr_2$	LiCl: $ZnBr_2$	LiBr: CsBr: RbBr	LiSCN: NaSCN	LiSCN: DMF	LiSCN: MEA	1,4 BDL: LiSCN	LiBr: MEA	LiCl: $ZnBr_2$	NH_4Br	NaOH: KOH: CsOH	1,4 BDL: $LiNO_3$	HDL: $LiNO_3$
R-133a																							
R-124a																							
R-134																							
R-11				1																			
R-30																							
R-31																							
R-12																							
R-21	1	1	1	1	1	1	1	2															
R-22					1	1			1														
R-123																							
R-131a																							
R-140a																							
R-1112a																							
R-1120																							
R-1130																							
SO_2			1	1			1																
CH_3NH_2														1	1	1	1						
$(CH_3)_2NH$																							
$(CH_3)_3N$																							
C_3H_7OH																							
CH_3OH																							
C_2H_5OH																							
H_2O										1								1			1		
NH_3			1																	1		1	1

Fig. 1. (continued).

REFRIGERANTS \ ABSORBENTS	EB	DEM	LLA	2-OCN	DBC	TMS	DMETEG: BA	DEF	TMM	LiSCN: DMETEG	DEG	NaOH	KOH	NaOH: KOH	$LiNO_3$: $NaNO_3$: KNO_3	LiCl: $CaCl_2$: $ZnNO_3$	LiBr: H_2O
R-133a																	
R-124a																	
R-134																	
R-11		1	1	1													
R-30																	
R-31																	
R-12							1										
R-21	1			1				1									
R-22	1				1	1	1	1	1								
R-123																	
R-131a																	
R-140a																	
R-1112a																	
R-1120																	
R-1130																	
SO_2																	
CH_3NH_2										1							2
$(CH_3)_2NH$																	
$(CH_3)_3N$																	
C_3H_7OH																	
CH_3OH																	1
C_2H_5OH																	
H_2O											1	1	1	1	1	1	
NH_3																	3

Fig. 1. (continued).

REFRIGERANTS \ ABSORBENTS	NMP	DMETEG	DMF	DBP	DMMP	IBA	DMSO	LiBr: $ZnBr_2$: EG	LiBr: $ZnBr_2$: DEG	LiBr: $ZnCl_2$	LiBr: 4, BLN	PPA	H_2O	H_2SO_4	GYL	LiI: $ZnBr_2$	LiBr: $ZnBr_2$: DMEDEG	LiBr: $ZnBr_2$: PD	LiI: LiBr: EG	$LiNO_3$: H_2O	H_2O: CrO_3	TDK
R-133a	3	2	2																			
R-123a		5																				
R-134																						
R-152			2																			
R-123																						
R-143																						
R-12				1																		
R-21																						
R-22				5	2	2	1															
TFE	4	4																				
CH_3NH_2															1							
$C_2H_5NH_2$													1									
C_3H_7OH																						
C_2H_5OH																						
CH_3OH													1			3						
H_2O								1	1	3	3	1		1			1	1	1			
NH_3																				1	1	
HFIP		1																				
$CH_3(CH_2)_4CH_3$																						1
PFPA		1																				

Fig. 1. (continued).

REFRIGERANTS	DMPU	DMEU	NMC	NFM	EC	PC	SL	CUM	DWA	QUN	BZL	DMPH	DET	DCP	DBS	DCM	OA	MB	PB	MSA	HMPT	DDP	BZA	ABSORBENTS
HFIP	2	1	1	1	1	1	1	1		1														
TFE	2	1	1						1	1	1													
R-22												1	1	1	1	1	1	1	1	1	1	1	1	
R-12												1		1	1	1	1	1	1	1			1	

Fig. 1. (continued).

REFRIGERANTS \ ABSORBENTS	$ZnBr_2$	LiBr: CsBr: RbBr	LiCl: $ZnCl_2$	LiSCN	$ZnBr_2$: LiBr: DEG	$ZnBr_2$: LiBr: MBEDEG	$ZnBr_2$: LiBr: PD	$ZnBr_2$: LiBr: EG	LiI: EG	LiI: LiBr: EG	LiCl: $ZnBr_2$	LiBr: $ZnCl_2$	LiBr: $ZnBr_2$	4, BLN: LiBr	LiBr	LiI	LiCl	LiBr: LiSCN	LiBr: EG	H_2O
R-133a																				
R-123a																				
R-134																				
R-152																				
R-123b																				
R-123																				
R-143																				
R-124																				
R-21																				
R-22																				
TFE																				
CH_3NH_2																				
$C_2H_5NH_2$																				
C_3H_7OH															1					
C_2H_5OH															1	1				
CH_3OH				1									3		7	2	2			
H_2O	1	1	1	1	1	1	1	1	2	1	3	2	5	3	12	1	2	5	2	
NH_3																	1			7
HFIP																				

Fig. 2. Number of references for crystallization temperature data.

REFRIGERANTS \ ABSORBENTS	CsF	CsBr	NaSCN	NaOH	KOH	NaOH: KOH	NaOH: KOH: CsOH	LiCl: $CaCl_2$: $Zn(NO_3)_2$	$LiNO_3$: H_2O	$LiNO_3$: H_2O: 1,4 BDL	$LiNO_3$: H_2O: 1,6 HDL	$ZnBr_2$	H_2O: LiBr	LiI: $ZnBr_2$	$LiNO_3$	LiBr: CsBr	CsF: RbF	$ZnBr_2$: $CaBr_2$	LiBr: $ZnBr_2$: $CaBr_2$
R-133a																			
R-123a																			
R-134																			
R-152																			
R-123b																			
R-123																			
R-143																			
R-124																			
R-21																			
R-22																			
TFE																			
CH_3NH_2			1																
$C_2H_5NH_2$																			
C_3H_7OH																			
C_2H_5OH																			
CH_3OH													1	1	2				
NH_3			1						3	1	1					2		3	
HFIP																			
H_2O	1	1		1	1	1	1	1							1			1	1	1	1	1

Fig. 2. (continued).

REFRIGERANTS \ ABSORBENTS	ETFE	DMETEG	DBP	LiBr	LiCl	LiBr: LiSCN	4, BLN: LiBr	LiBr: $ZnCl_2$	LiBr: $ZnBr_2$: EG	LiCl: $CaCl_2$	LiBr: MEA	LiBr: EG	NH_4SCN	LiBr: H_2O
R-133a														
R-123a		1												
R-134														
R-152														
R-123b														
R-123														
R-143														
R-124														
R-21		1												
R-22		2	1											
TFE		2												
CH_3NH_2														
$C_2H_5NH_2$														
C_3H_7OH														
C_2H_5OH														
CH_3OH														
H_2O				10	2	2	1	2	1	1	2	1	1	
NH_3														1
HFIP														
$CH_3(CH_2)_4CH_3$														
R-31		1												

Fig. 3. Number of references for corrosion data.

REFRIGERANTS \ ABSORBENTS	LiSCN	DMA	DMH	DCP	DDP	DMF	IBA	DBP	DMEDEG	H_2O	DMETEG	LiI: $ZnBr_2$	$ZnBr_2$	LiBr: LiSCN	LiI	LiCl	LiBr	4, BLN: LiBr	LiBr: $ZnBr_2$	LiBr: EG	NaSCN
R-133a																					
R-123a																					
R-13						1															
R-152						2															
R-1123						1															
R-1113						1															
R-143																					
R-12						1															
R-21		1	1			2			1		2										
R-22		1		1	1	4	1	5	2		5										
TFE											1										
CH_3NH_2	1									1											
$C_2H_5NH_2$										1											
C_3H_7OH																					
C_2H_5OH										1					1		1				
CH_3OH												2	2				2		1		
H_2O						1								2	1	2	9	2	2	1	
NH_3	1									7	1										1
HFIP											1										
$CH_3(CH_2)_4CH_3$																					
SO_2		1				1					1										

Fig. 4. Number of references for heat of mixing data.

REFRIGERANTS \ ABSORBENTS	EFTE	DBS	DEF	NMP	DOS	TAN	DOP	NFM	DEO	DMETrEG	DEA	ETL	DMPU	H_2SO_4	LiCl: $CaCl_2$: $Zn(NO_3)_2$	LiBr: EG: 4, BLN	$LiNO_3$	1,4 BDL
R-133a				1														
R-123a	1																	
R-134																		
R-152																		
R-123b																		
R-123																		
R-143																		
R-124																		
R-21			1						1	1	1	1						
R-22		1	1		1	1	1											
TFE				1									1					
CH_3NH_2																		
$C_2H_5NH_2$																		
C_3H_7OH																		
C_2H_5OH																		
CH_3OH																		
H_2O														1	1	1		
NH_3										1							1	1
HFIP								1										
$CH_3(CH_2)_4CH_3$																		

Fig. 4. (continued).

REFRIGERANTS \ ABSORBENTS	NaSCN	ETFE	H_2O	LiI: $ZnBr_2$	LiSCN	$ZnBr_2$	LiBr: $ZnBr_2$: EG	LiBr: $ZnCl_2$	LiBr: $ZnBr_2$	EG: LiBr	4, BLN: LiBr	LiBr: LiSCN	LiI	H_2O: LiBr	LiBr	LiCl	H_2O: $LiNO_3$	DMF
R-133a			1															
R-123a																		
R-134																		
R-152																		
R-123b																		
R-123																		
R-143																		
R-124																		
R-21																		
R-22																		
TFE																		
CH_3NH_2				1	1									1				
$C_2H_5NH_2$				1														
C_3H_7OH																		
C_2H_5OH															1			
CH_3OH					1	2	1			2				1		4		
H_2O								1	3	1	1	3	2	1		8	2	1
NH_3		1		4		1									2			1
HFIP																		
$CH_3(CH_2)_4CH_3$																		

Fig. 5. Number of references for liquid-phase density data.

REFRIGERANTS \ ABSORBENTS	NMP	DMETEG	DMF	DMETrEG	IBA	TEG	QUN
R-133a	1						
R-123a		1					
R-134							
R-152			2				
R-123b							
R-123							
R-143							
R-124							
R-21			2				
R-22		2	1	1	1		
TFE	1	1				1	
CH_3NH_2							
$C_2H_5NH_2$							
C_3H_7OH							
C_2H_5OH							
CH_3OH							
H_2O							
NH_3							
HFIP							1
$CH_3(CH_2)_4CH_3$							

Fig. 5. (continued).

REFRIGERANTS \ ABSORBENTS	LiBr: $ZnBr_2$: EG	LiCl: $CaCl_2Zn(NO_3)_2$	DMEU	NMP	DMETEG	LiI: $ZnBr_2$	$ZnBr_2$	H_2SO_4	NaOH	LiBr: $ZnBr_2$	LiBr: $ZnCl_2$	LiBr: $ZnBr_2$	H_2O: LiBr	H_2O	LiBr	LiCl	LiI	LiBr: LiSCN	4, BLN: LiBr	EG: LiBr
R-133a				1																
R-123a					2															
R-134																				
R-152																				
R-123b																				
R-123																				
R-143																				
R-124					1															
R-21					1															
R-22				1	4															
TFE			1	1	1															
CH_3NH_2													2	1						
$C_2H_5NH_2$														1						
C_3H_7OH																				
C_2H_5OH														1	1		1		4	
CH_3OH						2	1			1		1			2					
H_2O	1	1						1	1	2	4	1			12	3	1	1	3	1
NH_3													1	13						
HFIP																				

Fig. 6. Number of references for vapor and liquid-phase enthalpy data.

REFRIGERANTS \ ABSORBENTS	DBS	DBP	DMEDEG	DMETrEG	IBA	DMMP	DMF	DMPU
R-133a								
R-123a								
R-134								
R-152								
R-123b								
R-123								
R-143								
R-124								
R-21							1	
R-22	1	2	4	1	1	1	2	
TFE								1
CH_3NH_2								
$C_2H_5NH_2$								
C_3H_7OH								
C_2H_5OH								
CH_3OH								
H_2O								
NH_3								
HFIP								

Fig. 6. (continued).

REFRIGERANTS \ ABSORBENTS	NaSCN	DMH	DMA	DMETEG	DMEDEG	IBA	DMF	DMMP	LiI: $ZnBr_2$	$ZnBr_2$	LiBr: $ZnBr_2$	LiSCN: LiBr	H_2O: LiBr	H_2O	LiBr	LiCl	LiI	4, BLN: LiBr	LiBr: EG	$LiNO_3$: H_2O	$LiNO_3$
R-133a																					
R-123a																					
R-134																					
R-152							2														
R-123b																					
R-123																					
R-143																					
R-124																					
R-21		1	1		1		1														
R-22		1	1	2	4	1	1	1													
TFE																					
CH_3NH_2													2	1							
$C_2H_5NH_2$														1							
C_3H_7OH																					
C_2H_5OH															1		1				
CH_3OH									2	1	1				1						
H_2O											1	2			10	3	1	2	2		
NH_3	1												2	4						2	1
HFIP																					

Fig. 7. Number of references for specific heat data.

REFRIGERANTS \ ABSORBENTS	NaSCN	ETFE	NMP	DMETrEG	DMETEG	DMA	DMA + Phosphite	DMF	DMEDEG	LiBr: $ZnBr_2$	LiBr	BZA	DBS	MSA
R-133a		1	1	1										
R-123a		1		1	1									
R-134			1											
R-152														
R-123b														
R-123				1										
R-143a			1											
R-124			1		1	1	1	1	1					
R-21					1									
R-22					3	1		1	1					
TFE			1											
CH_3NH_2														
$C_2H_5NH_2$														
C_3H_7OH														
C_2H_5OH														
CH_3OH										1	1			
H_2O														
NH_3	1													
R-142												1	1	1
R-30							1							
R-31							1							

Fig. 8. Number of references for stability data.

REFRIGERANTS \ ABSORBENTS	NaSCN	ETFE	TEG	NMP	DMETEG	DMETrEG	DMF	IBA	LiI: $ZnBr_2$	$ZnBr_2$	LiSCN	LiBr: $ZnBr_2$: EG	LiBr: $ZnBr_2$	H_2O	LiBr	LiCl	LiI	LiBr: LiSCN	4, BLN: LiBr	LiBr: $ZnCl_2$	H_2O: $LiNO_3$	LiBr: EG	LiBr: CsF: RbF
R-133a		1		1																			
R-123a		1			1																		
R-134																							
R-152							2																
R-123b																							
R-123																							
R-143																							
R-124																							
R-21							1																
R-22					2	1	1	1															
TFE			1	1	1																		
CH_3NH_2											1			1									
$C_2H_5NH_2$														1									
C_3H_7OH																							
C_2H_5OH															1								
CH_3OH									2	1	1		2		2		1						
H_2O			1				1					1	1		6	2	1	2	3	2		1	1
NH_3	1										1			1							1		

Fig. 9. Number of references for viscosity data.

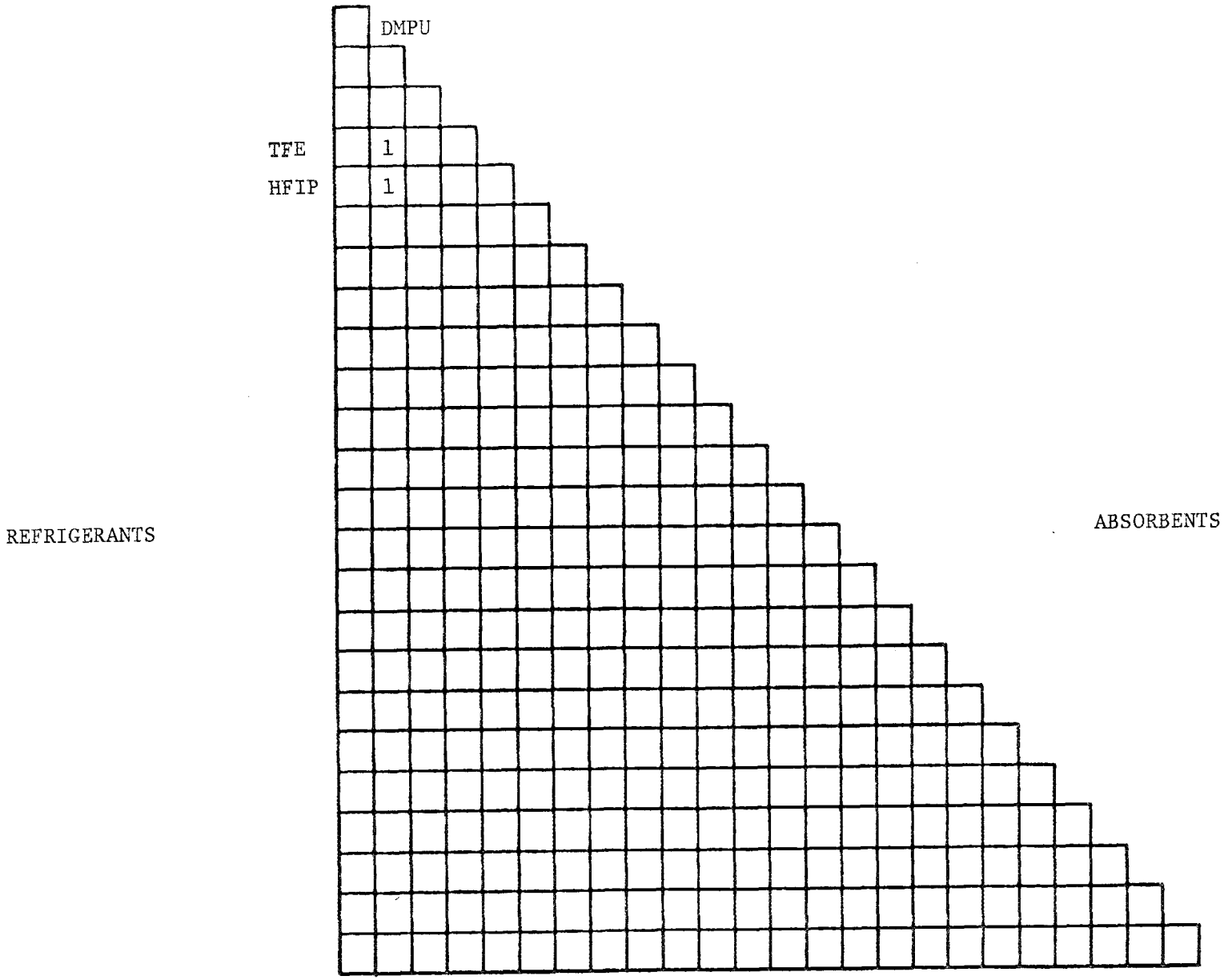

Fig. 9. (continued).

		LiBr	H_2O	NaSCN	DMETEG	LiBr: H_2O	LiBr: Baysilone	LiBr	LiBr: CsF: RbF	LiBr: EG	H_2O	LiBr	LiCl	NMP	ETFE	DMF	IBA	DMETEG	H_2O	LiBr: LiCl
Mass Transfer Rate	H_2O	7																		
	NH_3		2	1																
Heat Transfer Rate	NH_3		1																	
	R-22				1															
	CH_3OH					1														
	H_2O						1	2	1	1										
Thermal Conductivity	$C_2H_5NH_2$											1								
	CH_3NH_2											1								
	H_2O												4	2						
	R-133a														1	1				
	NH_3			1								1								
Refractive Index	R-152																2			
	R-21																1			
	R-22																1	1	1	
	NH_3																			1
	H_2O																			

Fig. 10. Number of references for mass and heat transfer, thermal conductivity, and refractive index data.

		ETFE	ETFE	H_2O	LiBr	LiCl	NMP	DMF	IBA	H_2O	LiBr: $ZnBr_2$	LiI	LiCl	LiBr: n-Octanol	LiBr
Flammability	R-133a	1													
Toxicity	R-133a		1	DBS											
Entropy	R-22			1											
	NH_3				6										
	H_2O					9	2								
Surface Tension	R-133a							1							
	R-21								1						
	R-22								1	1					
	$C_2H_5NH_2$									1					
	CH_3NH_2									1					
	H_2O										1	1	2	5	4

Fig. 11. Number of references for flammability, toxicity, entropy, and surface tension data.

3.3. COARSE SCREENING OF DATA FOR SELECTED FLUIDS

As mentioned earlier, large amounts of data and references for any fluid do not always guarantee adequate coverage of data needs at a required level of precision. In fact, they may only denote relative importance of a given fluid for an application and/or the existence of conflicts in important property data, which often are difficult to measure. In such cases, a first-order or coarse screening and evaluation of data for key fluids, properties, and regimes is of paramount importance. Such screening and evaluations were carried out as part of this study for selected or key absorption fluids.

Several approaches were considered for use in carrying out the review and coarse screening of data from multiple sources. These include

- Consideration of the author's statements concerning data quality;
- Assessment of the measurement technique and apparatus used to develop the data;
- Consideration of a given author's reputation for measuring data, where only one author's data were available for a fluid;
- Comparison of data plots for a given fluid using data scatter and internal consistency criteria to judge data quality as well as multiple-author data agreement; and

  Consideration of general trends of the plotted data as inferred from data for similar or homologous series fluids.

Particular emphasis was placed on screening data of fluids that were either already in use in commercial or prototype absorption cooling equipment or identified as potentially useful in absorption systems and subsequently experimentally investigated. Examples of such fluids are

- In commercial equipment, NH_3-H_2O, H_2O-LiBr
- Identified as potentially useful for heat pumps
  - Organic/fluids, R21-DMETEG, R22-DMETEG, etc.
  - Methanol/salt; CH_3OH-LiBr, CH_3OH-LiBr or $ZnBr_2$, etc.

In most instances, researchers have first focused on the development of vapor-liquid equilibrium data for these fluids and secondarily on other properties such as enthalpy, viscosity, stability, etc. Therefore, the screening approach selected to evaluate certain property data of the above fluids has

consisted of the side-by-side comparison of vapor pressure (PTx) data, equilibrium vapor composition (PTxy) data, enthalpy data, and viscosity data of various fluids.

NH_3-H_2O

Vapor-liquid equilibrium (PTx)

The ammonia-water absorption fluid pair has been extensively investigated for many years. Many experimental studies were conducted in Europe, some prior to 1932. Contributors include Mollier[145] (1908), Wucherer[266] (1932), Clifford and Hunter[38] (1932) and Pierre[167] (1959). In the U.S., Wilson[264] obtained a significant amount of PTxy data. In 1964, Macriss et al.[123] presented a summary of the published data and a side-by-side comparison of the data measured by several investigators. They also presented a set of recommended PTxy values based on their analysis.

Recently, Gillespie et al.,[64] Guillevic,[68] and Rizvi[187,188] obtained and presented PTxy data that spanned a wider range of pressure and temperature than previously reported. In addition to experimental data, several investigators have thermodynamically analyzed historical data to determine their internal consistency.

In this section of the report a side-by-side comparison is made of selected data sets of total pressure and vapor-liquid equilibrium to determine potential conflicts. Finally, the most recent PTxy data are compared with computed values in the literature developed by thermodynamic formulations.

Total pressure

The comparison of the total pressure measured by four investigators over three distinct solution concentrations (5, 20, and 40 wt % NH_3) is illustrated in Fig. 12. The data shown in the figure are actual experimental data. For all practical purposes, there are no significant differences between the data gathered by the four investigators, indicating that for the specific concentrations and temperatures shown, there are no conflicts in the data.

Equilibrium vapor composition (PTxy)

As previously mentioned, Macriss et al.[123] evaluated the data obtained by Wucherer,[266] Clifford and Hunter,[38] and Wilson,[264] to determine and recommend a "best" set of PTxy values for use in process calculations. With the aid of

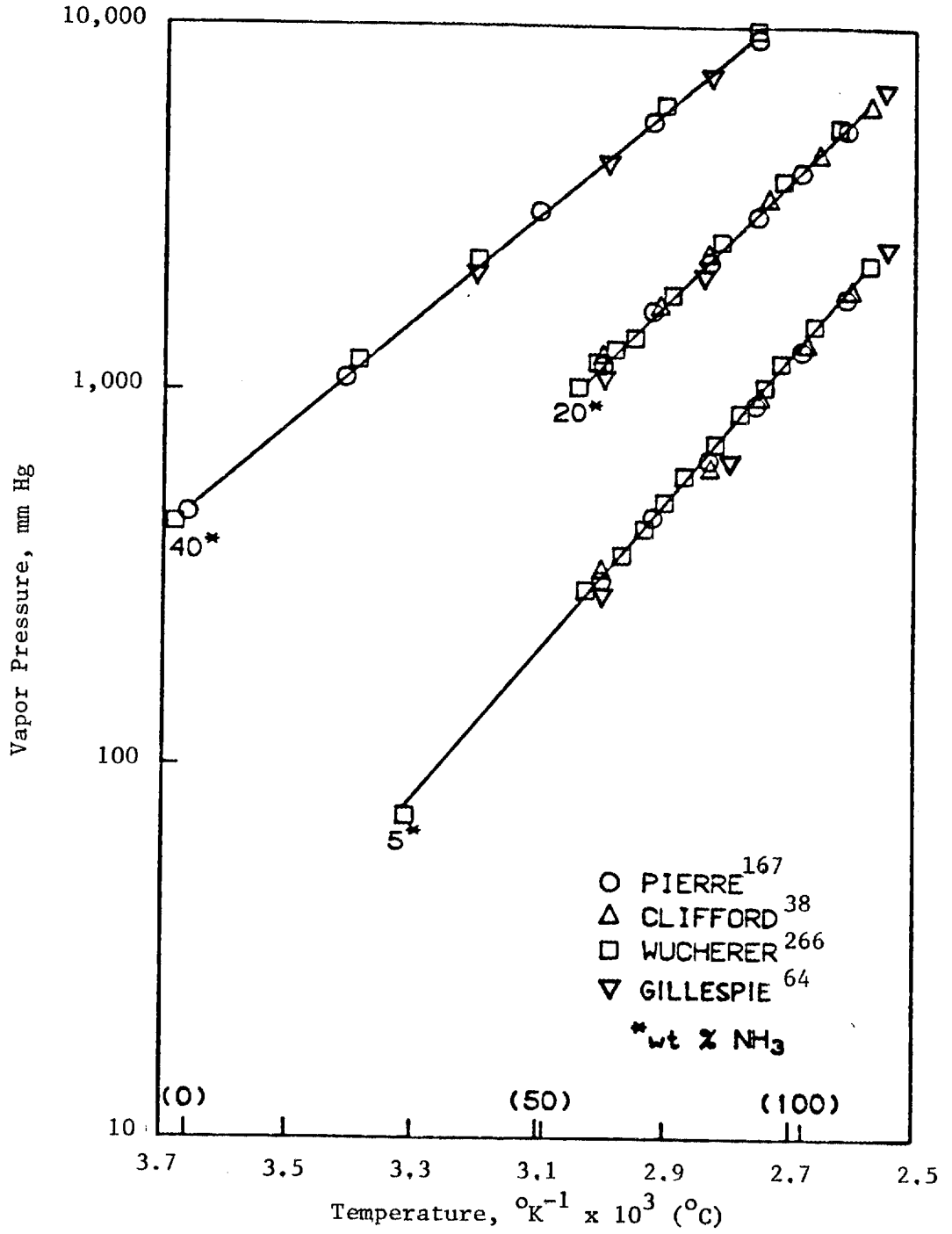

Fig. 12. Comparison of $NH_3 + H_2O$ vapor pressure-concentration data.

several directed experimental tests, in the ammonia-rich solution region, Macriss et al. compiled a recommended set of values over the range of pressure from 0.07 to 34.5 bar and temperature range from -50° to 215°C.

The recent data of Gillespie et al.[64] were obtained for pressures up to 200 bar and temperatures up to 316°C. The Gillespie et al. and Macriss et al. data at 60°C are shown in Fig. 13. There is very good agreement between the new data and the recommended compilation of Macriss et al. The Gillespie et al. data are claimed to be thermodynamically consistent and were well correlated using the Redlich-Kister approach to fitting activity coefficient data.

Thermodynamic evaluations

A major thrust of U.S. and European investigations has been to thermodynamically analyze historical data in order to determine the consistency of vapor liquid equilibrium data. For example, in 1947 Scatchard et al.[196] calculated equilibrium vapor compositions that were significantly different than measured values. Scatchard reached this conclusion through a Gibbs-Duhem integration, assuming water was essentially non-volatile.

More recently, Edwards[45] and then Won et al.[265] evaluated the thermodynamic consistency of the tabulated values presented earlier by Macriss. Again, as did Scatchard, Won projected water vapor concentrations, in equilibrium with ammonia-rich solutions, significantly below those given by Macriss. European researchers, specifically Schultz[199] and Ziegler and Trepp[277] have also thermodynamically analyzed the NH_3-H_2O system and again concluded that the reported measured vapor concentrations are higher for ammonia-rich solutions than their predictions.

The vapor-liquid equilibrium values at 60°C computed from these thermodynamic formulations are also presented in Fig. 13. It is evident that the calculated vapor compositions are substantially lower than measured values in the ammonia-rich solution region by as much as a factor of 2. This pattern appears to hold true at other temperatures in the ammonia-rich region of concentration. From these comparisons, it is concluded that the thermodynamic projections of vapor compositions (Scatchard, Bogart/Won, Schultz, Ziegler and Trepp) appear to be in error. The specific evidence is summarized as follows

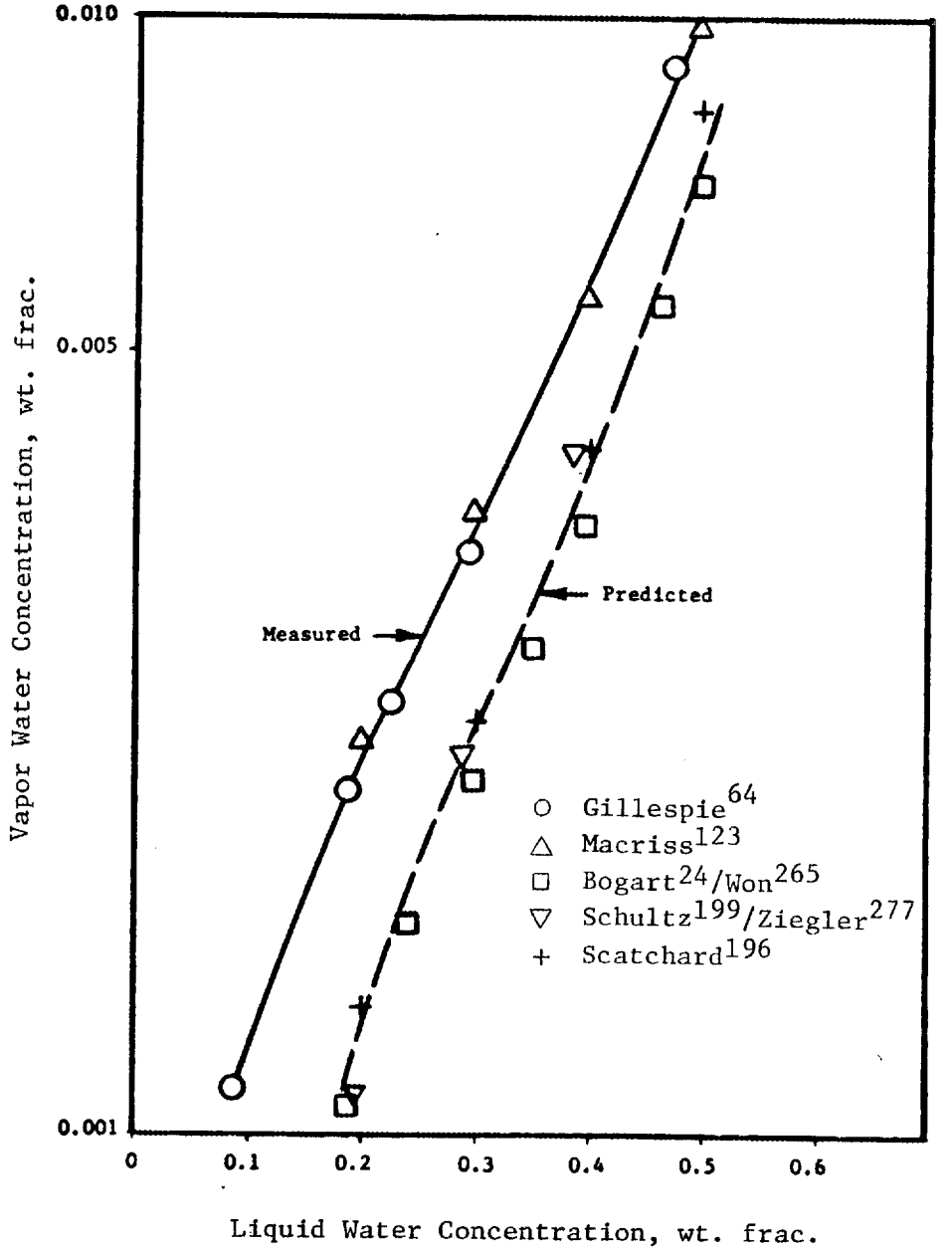

Fig. 13. Comparison of measured and predicted vapor composition of the $NH_3 + H_2O$ pair at 60°C.

- The new data of Gillespie et al.[64] compare favorably with historical values and the compilation of Macriss et al.[123]

- The Gillespie et al. data are claimed to be thermodynamically consistent and well correlated using the Redlich-Kister approach for fitting activity coefficients.

Enthalpy data

In the U.S. prior to 1964, tabulated values of liquid- and vapor-phase enthalpies for the NH_3-H_2O fluid system were based on European experimental studies conducted between 1929 and 1934. Specifically, Jennings and Shannon[96] in 1938 and Scatchard et al.[196] in 1947 produced enthalpy tables in systematic increments of composition and pressure based on either interpolations of experimental data (Jennings) or thermodynamic calculations (Scatchard). An analysis by Macriss et al. in 1964 indicated that the results derived from the method of Scatchard were in good agreement with historical data for the low-temperature region, below 25°C. However, Scatchard's values deviated about 15% from measured data at high temperatures and pressures.

The measurements by Macriss et al.[123] involved heat capacities of four liquid mixtures of ammonia and water containing between 0 and 40 wt % ammonia in the pressure range of 3.5 to 34.5 bar. By comparison, Scatchard's projections were consistently higher than the data of Macriss, deviating up to 15% at high temperatures. The differences are attributed to insufficient accuracy of the primary data utilized in the calculations of Scatchard. The Macriss data were consistently lower than historical European data, but the deviations from the latter data were smaller than those found by comparison of the Macriss data to the Scatchard projections.

Macriss also presented tabular values of liquid- and vapor-phase enthalpies for pressures ranging from 0.07 to 34.5 bar. Bogart,[24] on the basis of the analysis by Won,[265] summarized enthalpies at pressures ranging from 0.4 to 19.0 bar. A comparison of the Won and Macriss values at 60°C (Fig. 14) indicates only small deviations of 1 to 2%. The vapor-phase enthalpy projections of Won are 1 to 2% higher than the Macriss values, but the opposite trend is noted for the liquid-phase enthalpies.

In Europe, the most recent presentations of liquid- and vapor-phase enthalpies are charts prepared by Electrolux[50] (unpublished) and by Ziegler and Trepp.[277] The values of the latter investigators were developed from

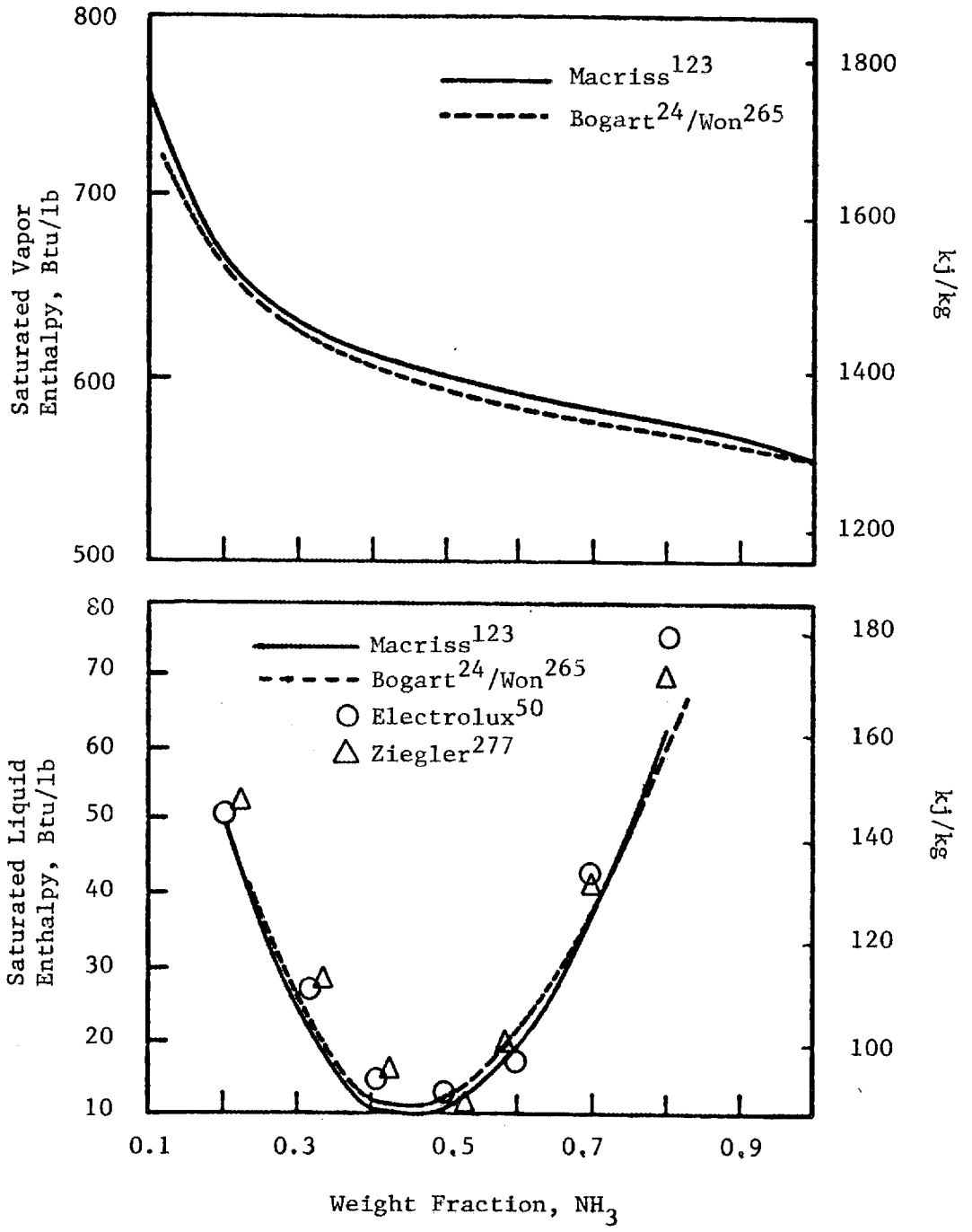

Fig. 14. Comparison of ammonia-water enthalpy data at 60°C.

equations of state. The liquid phase data extracted from the smoothed charts at a temperature of 60°C are also compared in Fig. 14.

At 60°C, the comparison indicates good agreement between the two sets of data at all solution concentrations, i.e., 0 to 100% NH_3. There is also good agreement with the compilations of Macriss et al. and Bogart.

H_2O-LiBr

Vapor-liquid equilibrium data

The H_2O-LiBr pair has been utilized in commercially available absorption cooling machines for many years and, therefore, a relatively large number of sources of published data were found. Data were found in Japanese investigations (Uemura and Hasaba,[248] Matsuda et al.,[133] and Osaka Gas[162]) and European investigations by Renz[183] and Usyukin.[261]

A comparison of vapor pressure data from two of the Japanese investigations and the two European sources is illustrated in Fig. 15, for a 50 wt % LiBr solution. The data from three of the sources (Renz, Matsuda, and Usyukin) fall practically on the same empirical straight line drawn through the actual points. The Uemura[248] data fall significantly below those of the other investigators by 15 to 20%, particularly in the low-temperature region below 30°C. Although not shown, similar behavior was noted for other compositions (20, 50 and 60 wt % LiBr) at low temperatures. Therefore, from a concensus viewpoint, the data of Uemura should be excluded from consideration at temperatures below 30°C.

All data taken prior to 1928 have been assembled, evaluated, and presented in the International Critical Tables (ICT).[82] In the U.S., Pennington[165] measured and reported vapor pressures above solutions with concentrations ranging from 50 to 68 wt % LiBr and temperatures from 25° to 177°C. Ellington et al.[52] showed that the Pennington results deviated from those previously reported in the International Critical Tables, with deviations averaging more than 10% of the pressure measured. Sufficient experimental details were not available to indicate which group of data is more accurate.

More recently, McNeely[137] evaluated all known data to present a consistent set for inclusion in the ASHRAE Handbook of Fundamentals. Major absorption cooling equipment manufacturers were surveyed by McNeely to obtain proprietary or unpublished information. Based on the Pennington data and proprietary data

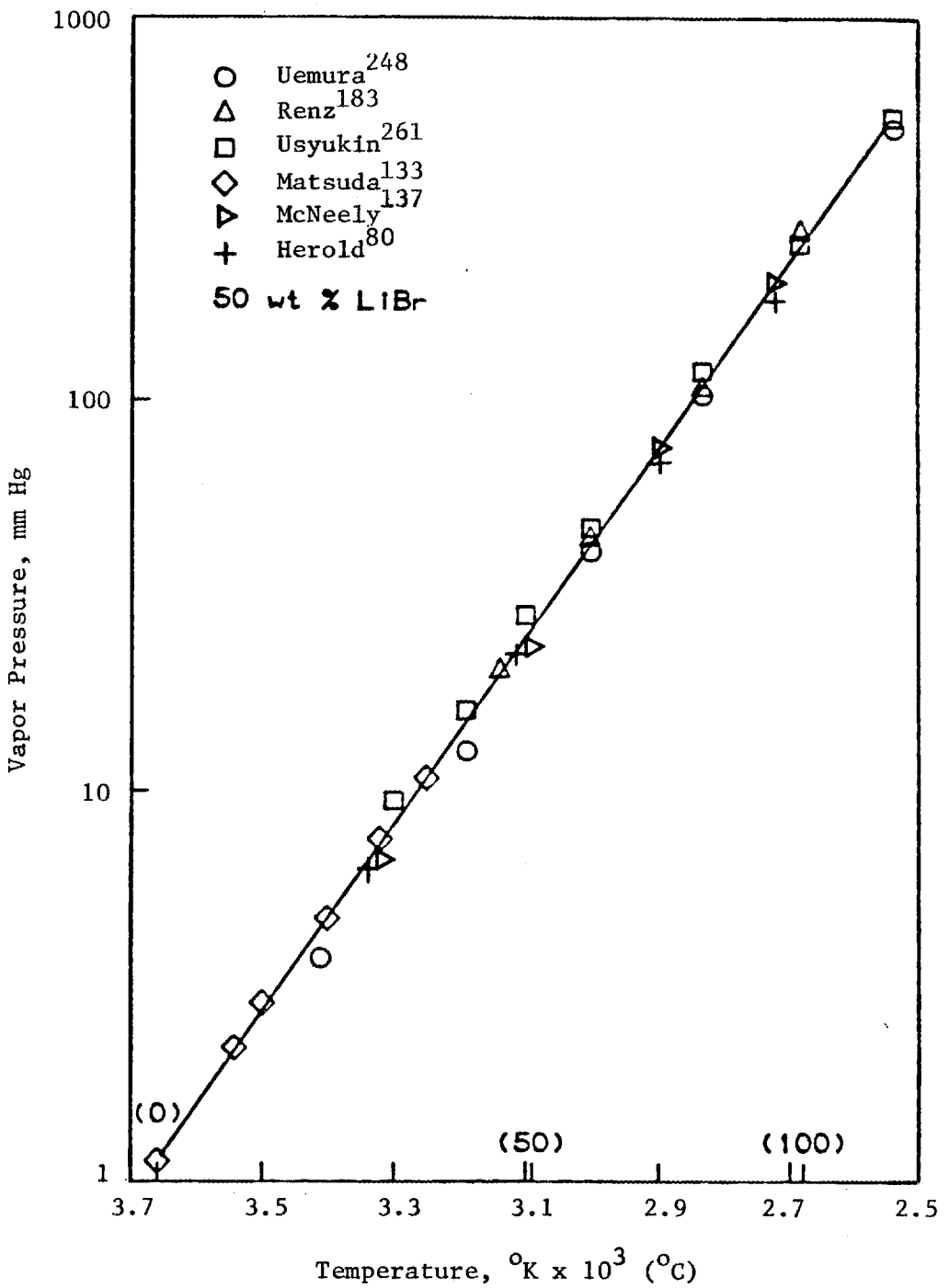

Fig. 15. Comparison of H_2O + LiBr vapor pressure data.

supplied by Carrier Corporation, McNeely developed polynomial correlations relating solution temperature, concentration, and vapor pressure.

Comparison of the dew points calculated from the polynomials to measured values indicated:

- Calculated values agreed well with the ICT data below LiBr solution concentrations of 44 wt %. In the concentration range of 45 to 60 wt % LiBr, the calculated dew points are 0.6 to 2.8°C lower.
- For solution concentrations above 45 wt % LiBr, the McNeely calculated values agreed with the Pennington data but not with the ICT compilations.
- There is little data available above solution concentrations of 60 wt % LiBr at atmospheric pressure (1.0 bar) to substantiate the correlations.

Recently, Herold and Moran,[80] in the U.S., developed a method for determining various thermodynamic properties based on an expression for the Gibbs free energy of the $LiBr/H_2O$ solution. The vapor pressures determined by the McNeely and Herold approaches at a 50 wt % LiBr solution are also presented in Fig. 15 and are compared with the actual experimental data, indicating good agreement.

Methanol-Salt Fluids

Methanol is a refrigerant that has been proposed as a replacement for water to prevent system freeze-up problems and to develop air-cooled systems. Most work has focused on methanol in combination with either LiBr or $ZnBr_2$ or a combination of both. In this section comparisons are made of PTX data for two binary solutions and of viscosity data for another solution.

CH_3OH-LiBr

Vapor-liquid equilibrium data

Four major sources of data were found for the CH_3OH-LiBr system. One from Europe by Renz,[183] one Japanese by Uemura et al.,[245] and two from the U.S., Aker et al.[1] and Biermann.[19]

The data from two investigators (Renz and Uemura) are compared in Fig. 16 for solution concentrations of 10, 30, and 50 wt % LiBr. At solution concentrations below 30 wt % LiBr, there is general agreement between these two sets of data. At the low solution concentration of 10 wt % LiBr, the Renz vapor pressures are about 10 to 15% lower than the Uemura values at identical conditions. At solution concentrations greater than 30 wt % LiBr, the Uemura data

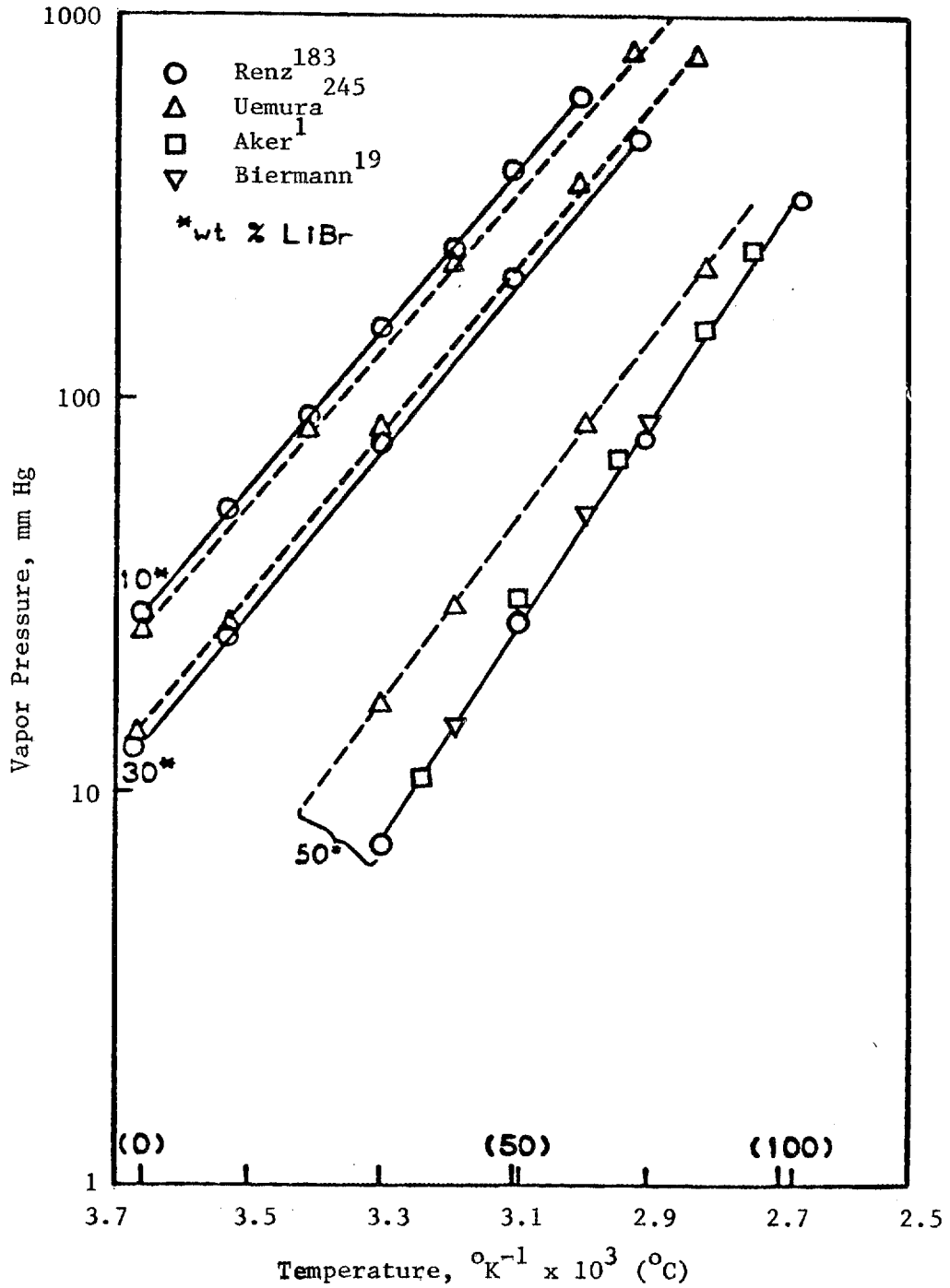

Fig. 16. Comparison of CH_3OH + LiBr vapor pressure-concentration data.

are substantially higher than Renz's values, by up to 100 %. Deviations increase as solution concentration increases. Superimposition of the data from the two U.S. sources (Aker and Biermann) shows good agreement with the data of Renz.

In the previous section, where H_2O-LiBr data were discussed, it was also shown that three investigators (including Renz) produced data in general agreement, while Uemura's data for that fluid pair also departed from the trend line drawn through the other investigators data.

Viscosity

Renz[183] and Uemura[245] measured and reported solution viscosities for the CH_3OH-LiBr system. The data are compared in Fig. 17 at a solution concentration of 35 wt % LiBr. The Uemura data are higher by one to two centipoises through the temperature range of 10 to 50°C. Similar observations were made at other solution concentrations. Without a more careful screening of the methods and instrumentation used to obtain the primary data, no statement can be made as to which set is more accurate.

CH_3OH-$ZnBr_2$

Vapor-liquid equilibrium

Both Renz[183] and Uemura[241] have also investigated the CH_3OH-$ZnBr_2$ system. However, contrary to the wide deviations found between them in the CH_3OH-LiBr system, there is general agreement between the two sets of data, as shown in Fig. 18. Uemura's measurements are generally lower by a few percentage points at identical conditions of temperature and pressure.

CH_3OH-LiBr: $ZnBr_2$ (2:1)

Vapor-liquid equilibrium

A comparison of data obtained in the U.S. by Aker et al.[1] and Biermann[19] for this system is presented in Fig. 19. At a solution concentration of 44.2 wt % CH_3OH, the vapor pressures of Biermann are about 20 to 25% lower than those of Aker et al. At a lower concentration, 27.8 wt % methanol, better agreement is obtained, but the Biermann measured vapor pressures are now slightly higher (by 5 to 10%). Again, there is no independent evidence to judge which of the two sets might be more accurate.

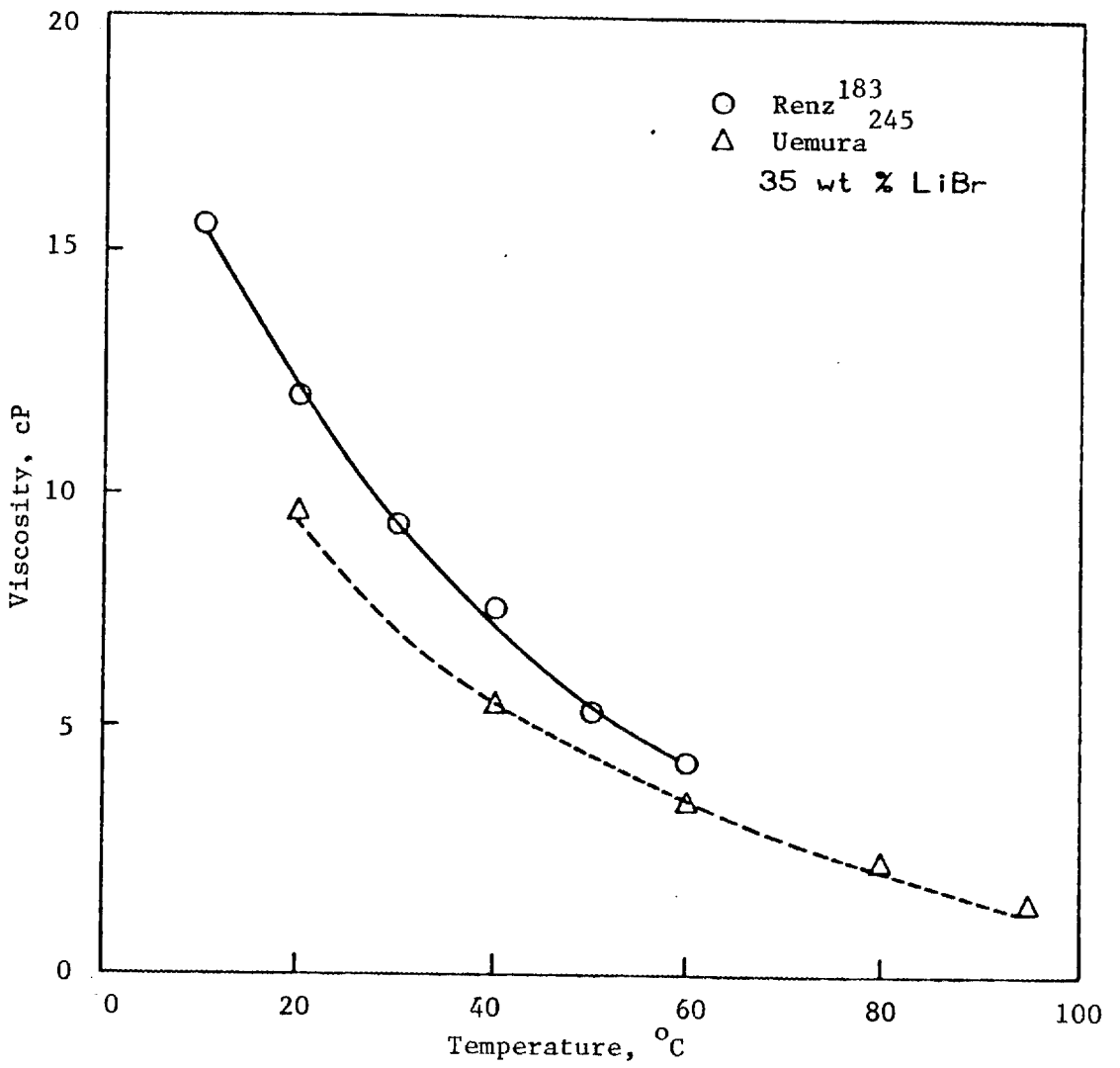

Fig. 17. Comparison of CH_3OH + LiBr viscosity data.

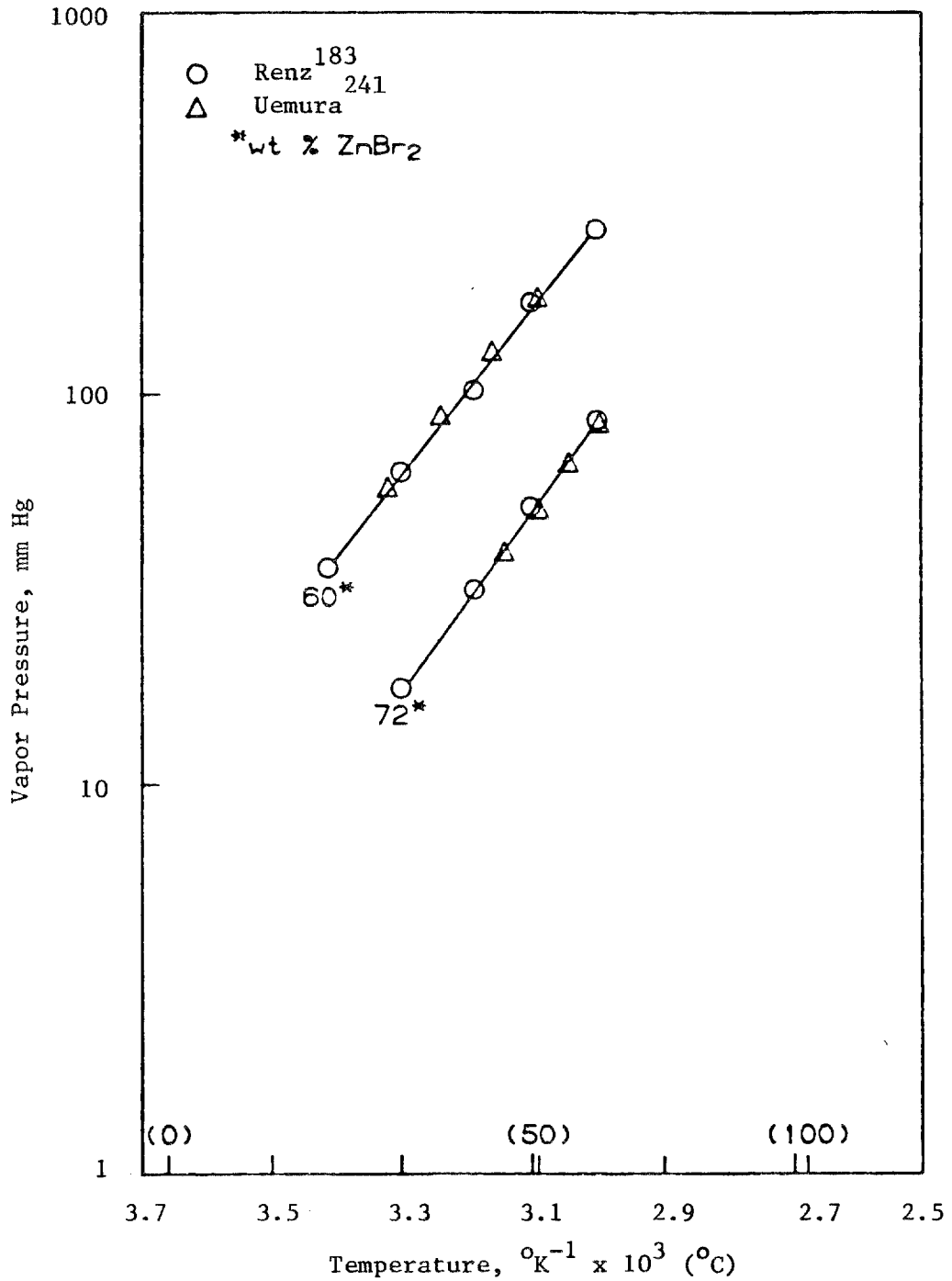

Fig. 18. Comparison of $CH_3OH + ZnBr_2$ vapor pressure-concentration data.

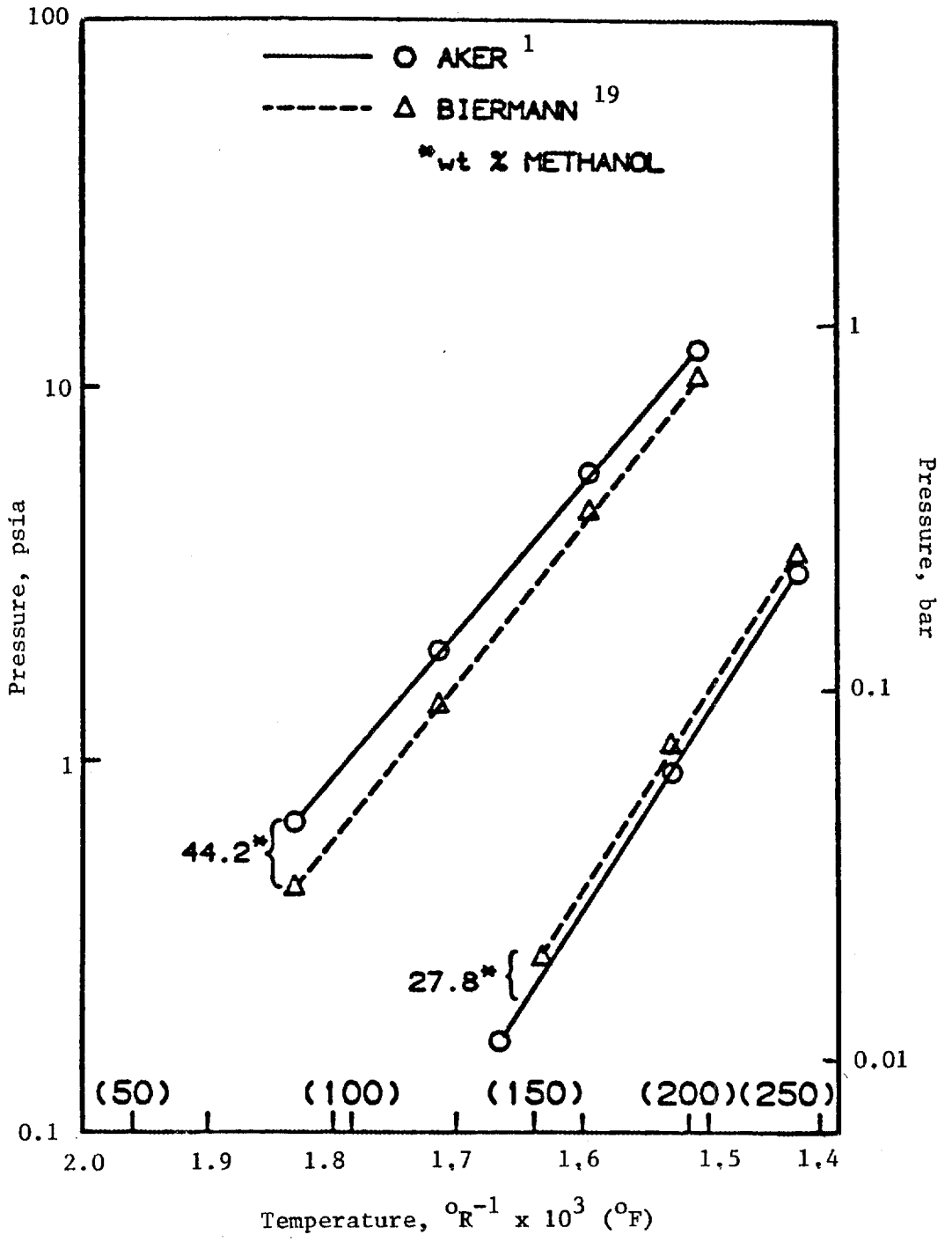

Fig. 19. Comparison of methanol + LiBr: $ZnBr_2$ (2:1) vapor pressure data.

Organic refrigerant-absorbent fluids

Extensive investigations have been conducted to determine the usefulness of organic fluids as refrigerants, mainly halogenated hydrocarbons, paired with high-boiling organic absorbents such as ethers, amides, and esters. An example of an organic refrigerant, methylamine, paired with a solid adsorbent, sodium thiocyanate, is also presented.

Refrigerants 123a, 133a-ETFE

For these fluids, the available U.S. data (Murphy[150,151]) practically cover most of the important fluid properties. Assessment of the accuracy or precision of the data, however, cannot be made from the available references.

R22-DMETEG

For this fluid, major U.S. experimental investigations on vapor-liquid equilibrium have been conducted by Mastrangelo,[132] Buclez,[35] and Albright et al.[3]

Macriss and Mason[124] thermodynamically evaluated the available data and produced smoothed PTX curves. The data of Mastrangelo showed considerable scatter around the smoothed isotherms of Albright et al., indicating poor internal consistency. A much smaller scatter of Albright's raw data had been evident except for the two highest temperatures, 121° and 135°C, where there were only a few experimental points for the entire range of concentration. Comparison of the scatter of the raw data from all sources, on the solubility of Refrigerant 22 in DMETEG (in the range of 25 to 121°C) are summarized in Table 6.

One European (Ehmke[47]) and two Japanese sources (Oouchi[159] and Suzuki and Sato[220]) were found for this pair. The data from these three sources are compared for solution concentrations of 10 and 40 wt % R22 in Fig. 20. Throughout the range of test temperatures, 10 to 127°C, there are no significant differences between the three sources of data.

R21-DMETEG

The data of Buclez,[35] Albright et al.,[3] and Mastrangelo[132] at a solution composition of 30 mol % R21 are illustrated in Fig. 21. The agreement is good at temperatures below 51.7°C, whereas the Mastrangelo vapor pressure data are about 5% lower than those of the others at temperatures in excess of 62.8°C.

Table 6. Deviation of solubility data from various sources from the final smoothed values for R22-DMETEG

	Data of Albright et al.[3]		Data of Mastrangelo[132]	
Temperature (°C)	Number of points	Average deviation (%)	Number of points	Average deviation (%)
28.3	9	0.74	11	4.6**
55.8	9	0.22	12	0.7
85.8	9	0.55	11	0.5
110.9	9	0.13	3	3.3†

* Interpolated values.
** All values of x_r equal or higher than smooth curve.
† All values of x_r equal or lower than smooth curve.

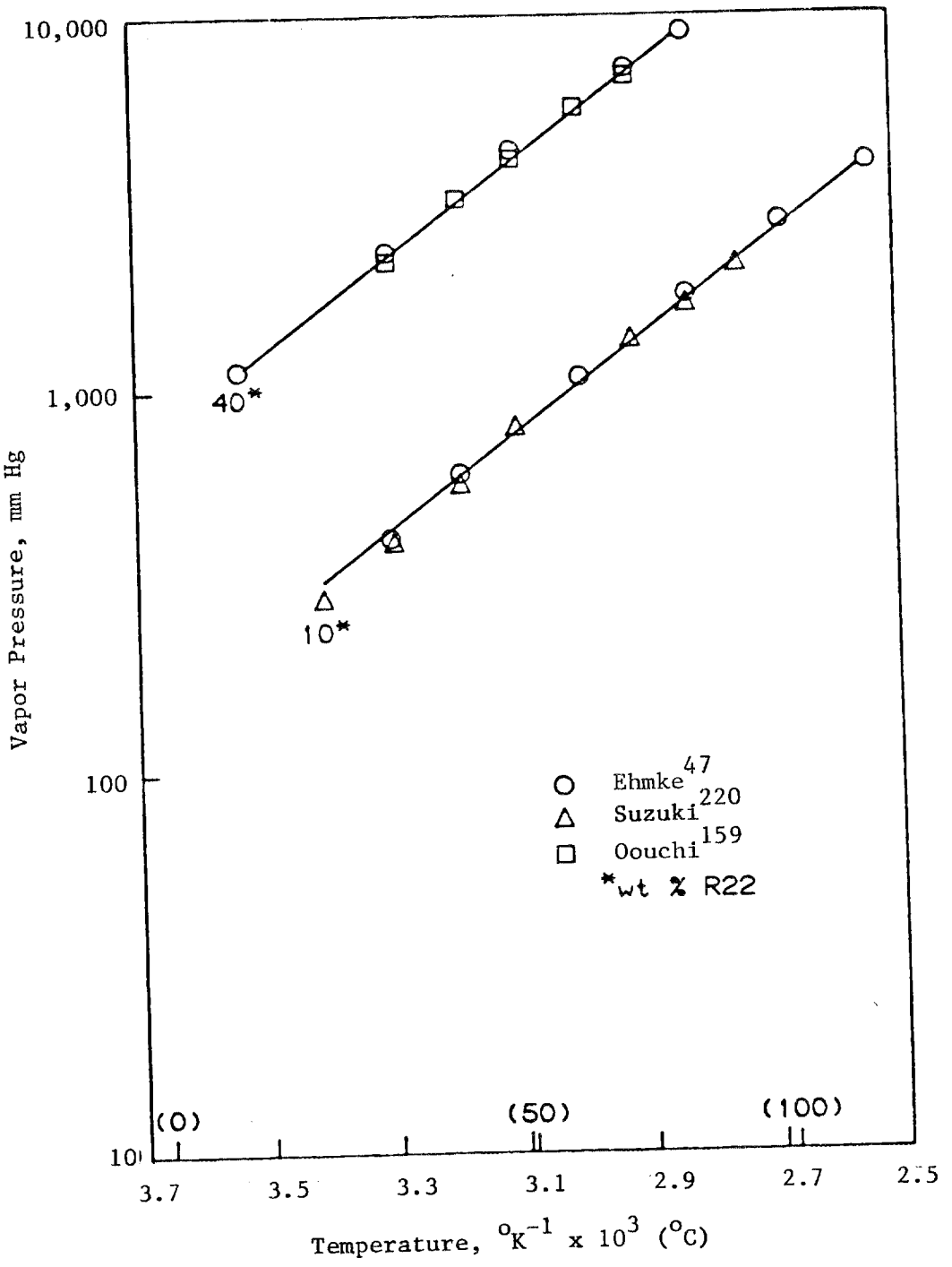

Fig. 20. Comparison of R22 + DMETEG vapor pressure-concentration data.

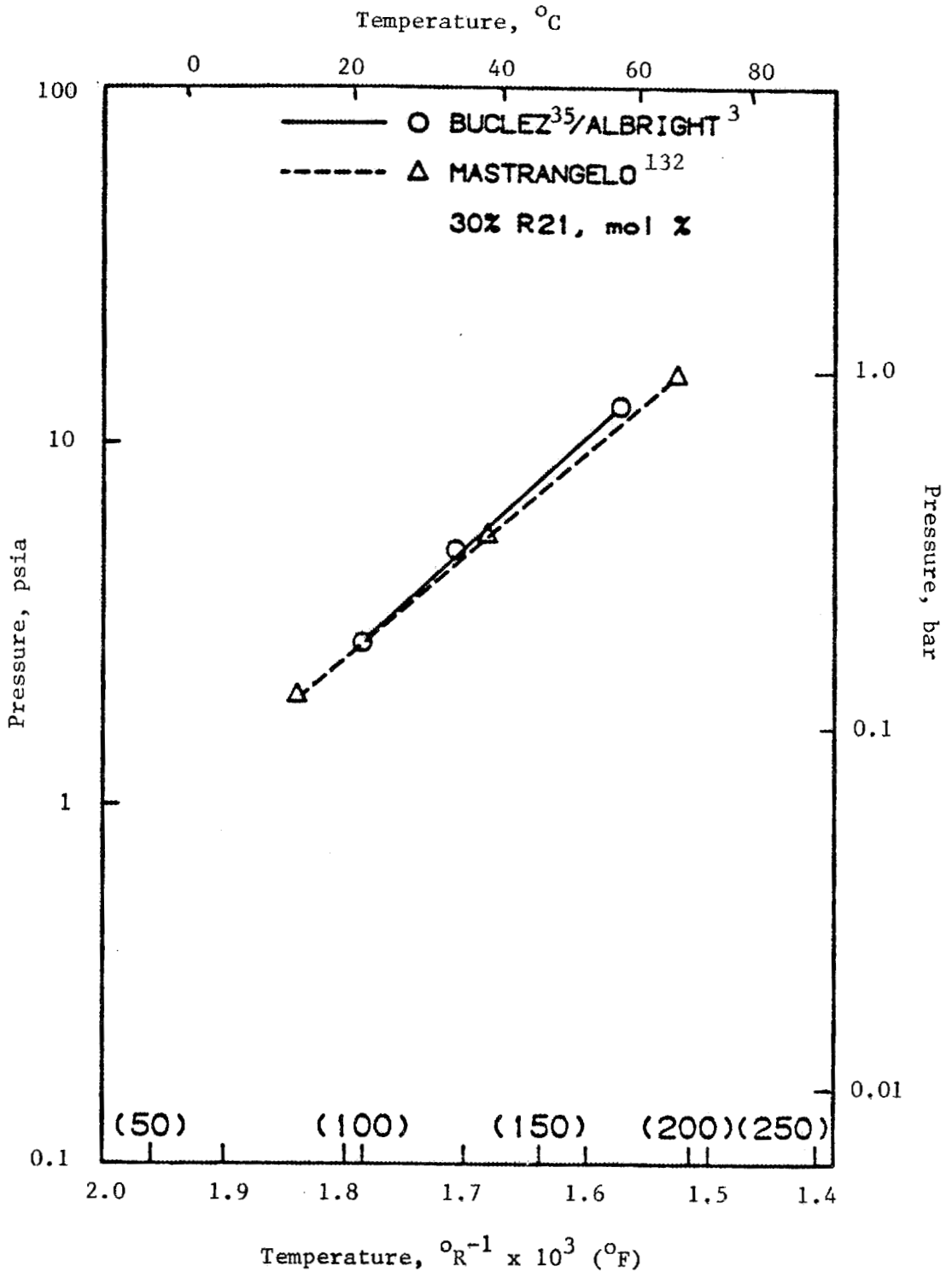

Fig. 21. Comparison of R21 + DMETEG vapor pressure data.

R22-DMA

Only a small overlap exists for the data of Podoll[173] and Albright et al.[3] in the temperature range of 24 to 35°C. However, within that range, the agreement is good at a solution concentration of 26 mol % R22, with Podoll's data about 3 to 5% lower than that of Albright et al. (Fig. 22).

R21 or R22-DMH

The data of Podoll[173] and Biermann[18] at a solution concentration of 37 mol % R21 are illustrated in Fig. 23. The Biermann data exhibit a significantly smaller slope than the trend line drawn through Podoll's data. At low temperatures (50°F), deviations up to 30 to 40% occur, with the Biermann data corresponding to higher vapor pressure values.

For the R22-DMH fluid, and at a solution concentration of 30 mol % R22, the Biermann data exhibit vapor pressures 20 to 50% larger than those of Podoll, as shown in Fig. 23. As was the case for the R21 + DMH fluid, the deviations are greatest at low temperatures and the slope of the Biermann trend line is smaller.

CH_3NH_2-NaSCN

This fluid is an example of an organic refrigerant in combination with an inorganic salt absorbent. Two sources of smoothed data exist for this combination, by Rush et al.,[194] with tabulated values, and Biermann[18] in graphical form. The comparison of the vapor pressures from the two sources at solution concentrations of 50 and 62 wt % CH_3NH_2 is illustrated in Fig. 24. At both concentrations, the Biermann pressures are significantly lower, by about 40%, than those of Rush et al. There is no obvious reason for stating which of the two sources contains more accurate data. The experimental procedures used by Biermann were presented in the reference.

3.4. FINE SCREENING OF NH_3-H_2O DATA

The NH_3-H_2O data were selected for fine screening because the pair is used in commercially available equipment and there is a need to provide a recommended set of PTxy values covering a wider range of conditions (pressure, temperature, and composition) than had been previously reported. The important reasons for screening are summarized as follows:

- New data have recently appeared in the literature,
- Discrepancies have been noted between predicted and measured PTxy data, and

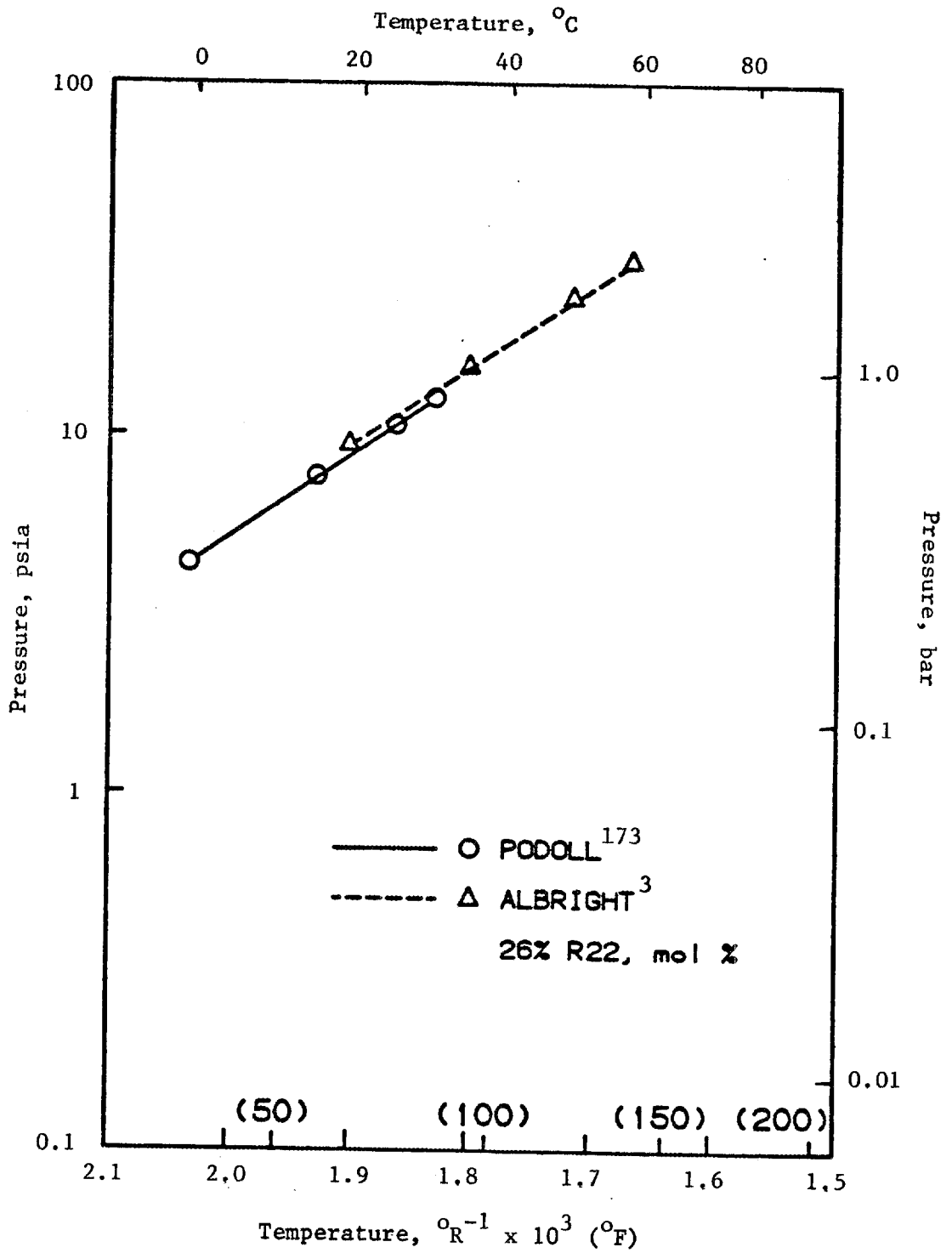

Fig. 22. Comparison of R22 + DMA vapor pressure data.

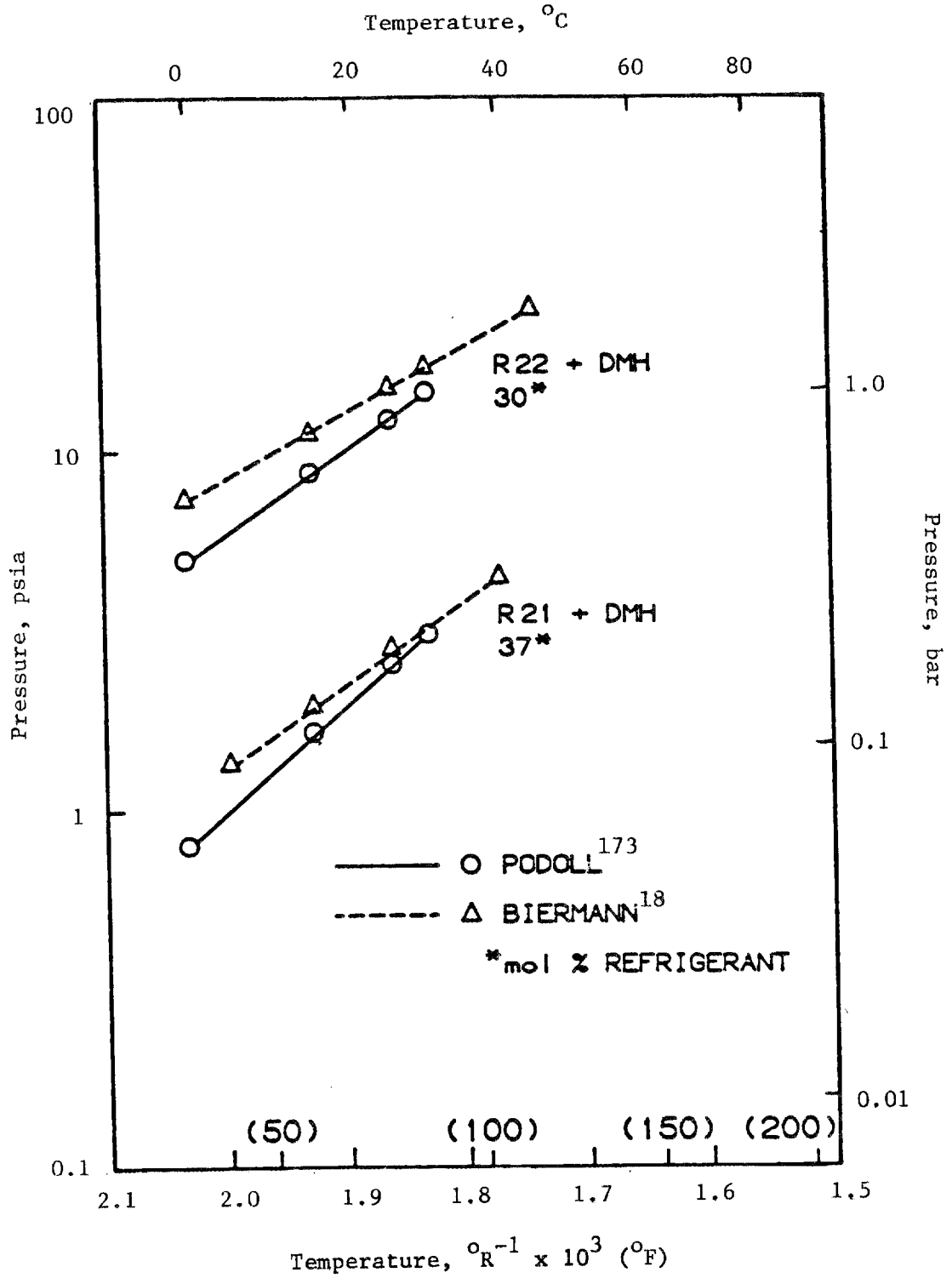

Fig. 23. Comparison of R21 + DMH and R22 + DMH vapor pressure data.

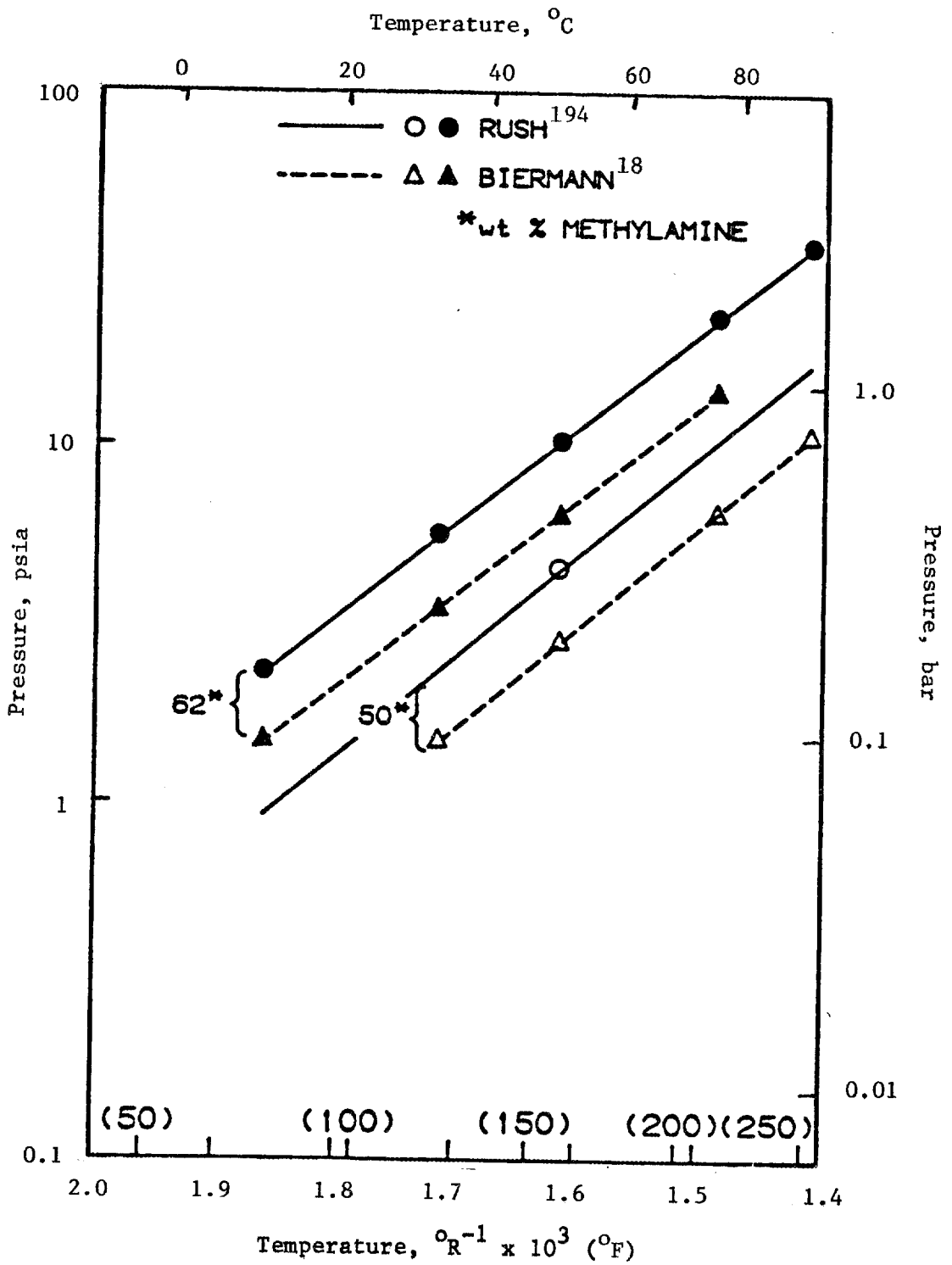

Fig. 24. Comparison of methylamine + sodium thiocyanate vapor pressure data.

- Advanced cycle calculations require accurate PTxy values beyond the range of present compilations.

Recently four sets of PTxy equilibrium data appeared in the literature and extended the range of pressure, temperature, and compositions previously reported:

- Gillespie et al.[64] presented PTxy data in the range of pressure from 0.07 to 200 bar and temperatures from 40 to 316°C over the entire liquid composition range.
- Guillevic[68] presented data at three isotherms 130, 180, and 230°C.
- Rizvi[187,188] obtained and presented data in ranges similar to those shown for Gillespie et al.
- Tsiklis et al.[223] presented data along eight isotherms, temperatures ranging from 97 to 350°C and pressures from 1 to 200 bar.

In addition to data, tabular values based on thermodynamic formulations and empirical polynomials developed from data considerations have also appeared in the literature that facilitate cycle computations.

It is, therefore, necessary to compare and evaluate primary data sets, first to each other and then to thermodynamic predictions and polynomial estimates. A set of recommended PTxy values can then be compiled based on the results of the aforementioned analysis.

The evaluation process consisted of the following steps:

- Comparison of measured total pressure data obtained by various investigators at common temperatures to determine relative spread in the primary data
- Comparison of measured PTxy data at common temperatures to determine spread in primary data
- Comparison of PTxy data and previous thermodynamic projections to reconcile differences
- Comparison of PTxy data and polynomial projections to determine usefulness of current estimating techniques for cycle calculations
- Development of extended PTxy tables based on the comparative evaluation.

Comparison of Measured Total Pressure

To begin the analysis, total pressure data gathered by various investigators were compared at two isotherms, 80 and 133°C, as shown in Fig. 25. Pressures

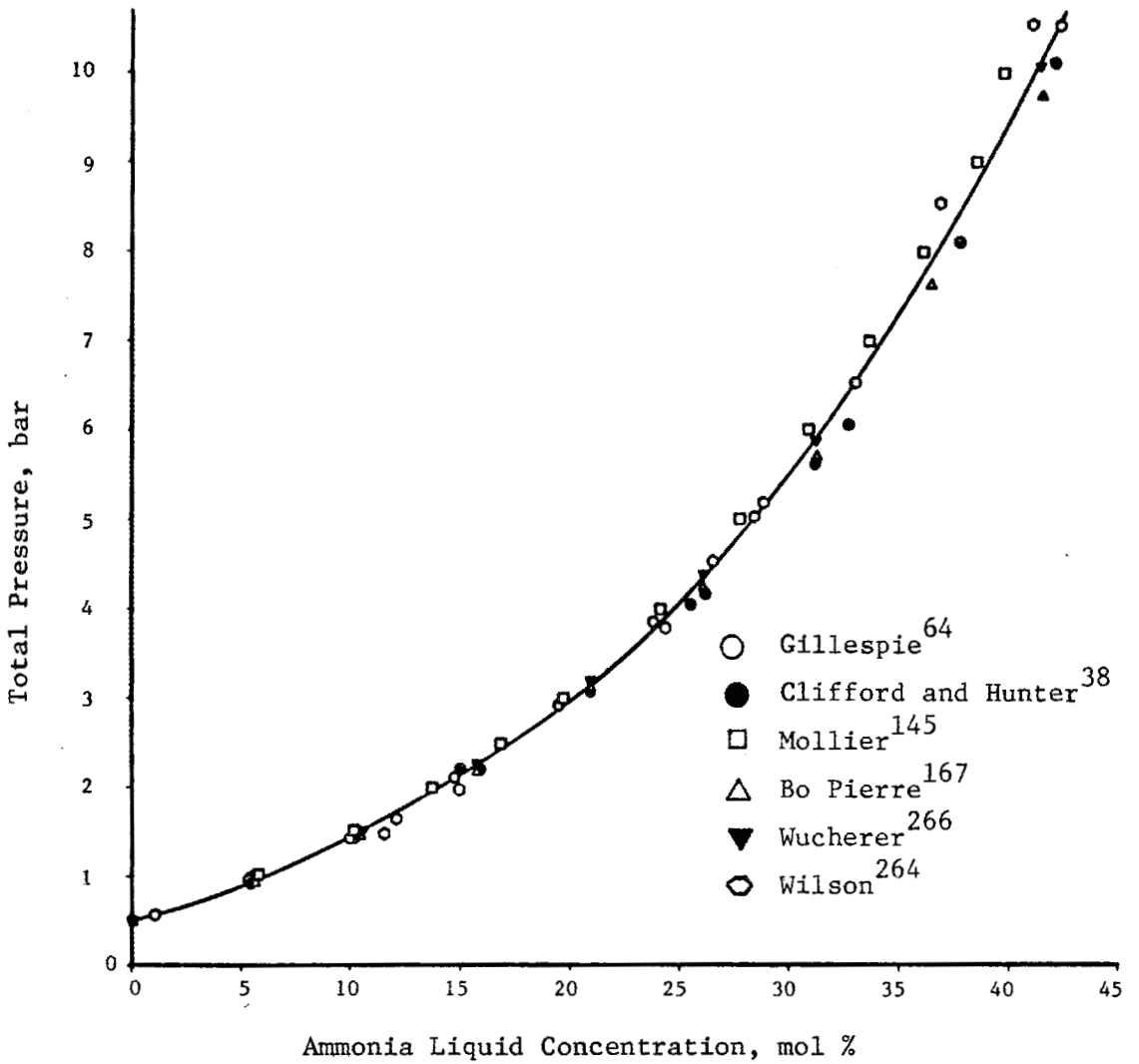

Fig. 25. Comparison of total pressure data at 80°C.

were generally reported at these temperatures, thus eliminating the need for interpolations to reduce data to a common temperature.

The important observations made from scanning the data obtained by six investigators shown in Fig. 25 are summarized as follows:

- There is general agreement in the measured pressure between sources in the solution concentration range of 0 to 45 mol % NH_3. For example, at a solution concentration of 15 mol % NH_3, the spread in the pressure is only about 0.2 bar compared with about 1 bar at a concentration of 40 mol % NH_3.
- The spread in the measured pressure increases as the ammonia solution concentration increases.
- The new data obtained by Gillespie et al.[64] appear to be representative of the total historical data set obtained by the other five investigators.

The total pressure data obtained at 133°C by three investigators (Gillespie et al.[64], Guillevic,[68] and Rizvi[187,188]) are shown in Fig. 26. The important conclusions obtained from scanning this data set are summarized as follows:

- There is general agreement between them up to a solution concentration of 50 mol % ammonia. At richer solution concentrations, the data of Rizvi are significantly higher, by up to 10 bar, than those obtained by Gillespie and also exhibit an unusual curvature in the range of solution concentration of 60 to 80 mol % ammonia.
- Because of the unusual nature of the Rizvi data, a smooth curve was drawn through the data of Gillespie et al. as representative of the PX relationship at 133°C. The data of Gillespie et al. and Guillevic are also in agreement up to a solution concentration of 60 mol % ammonia.

Comparison of PTxy Data

Gillespie et al.[64] compared their smoothed PTxy data (in terms of relative volatility) to those obtained by Wilson,[264] Wucherer,[266] Guillevic,[68] Rizvi,[187,188] and the compilation of Macriss et al.[123] The Gillespie et al. approach consisted of correlating the data obtained on an isotherm, using the Redlich-Kister equation for fitting activity coefficient data. The comparison between the relative volatility of Gillespie et al. and of the other investigators is summarized as follows:

- Wilson, ±5.7%
- Wucherer, ±11.6%
- Guillevic, ±14.1% (better at low temperatures, 80-100°C)
- Rizvi, ±24.0%

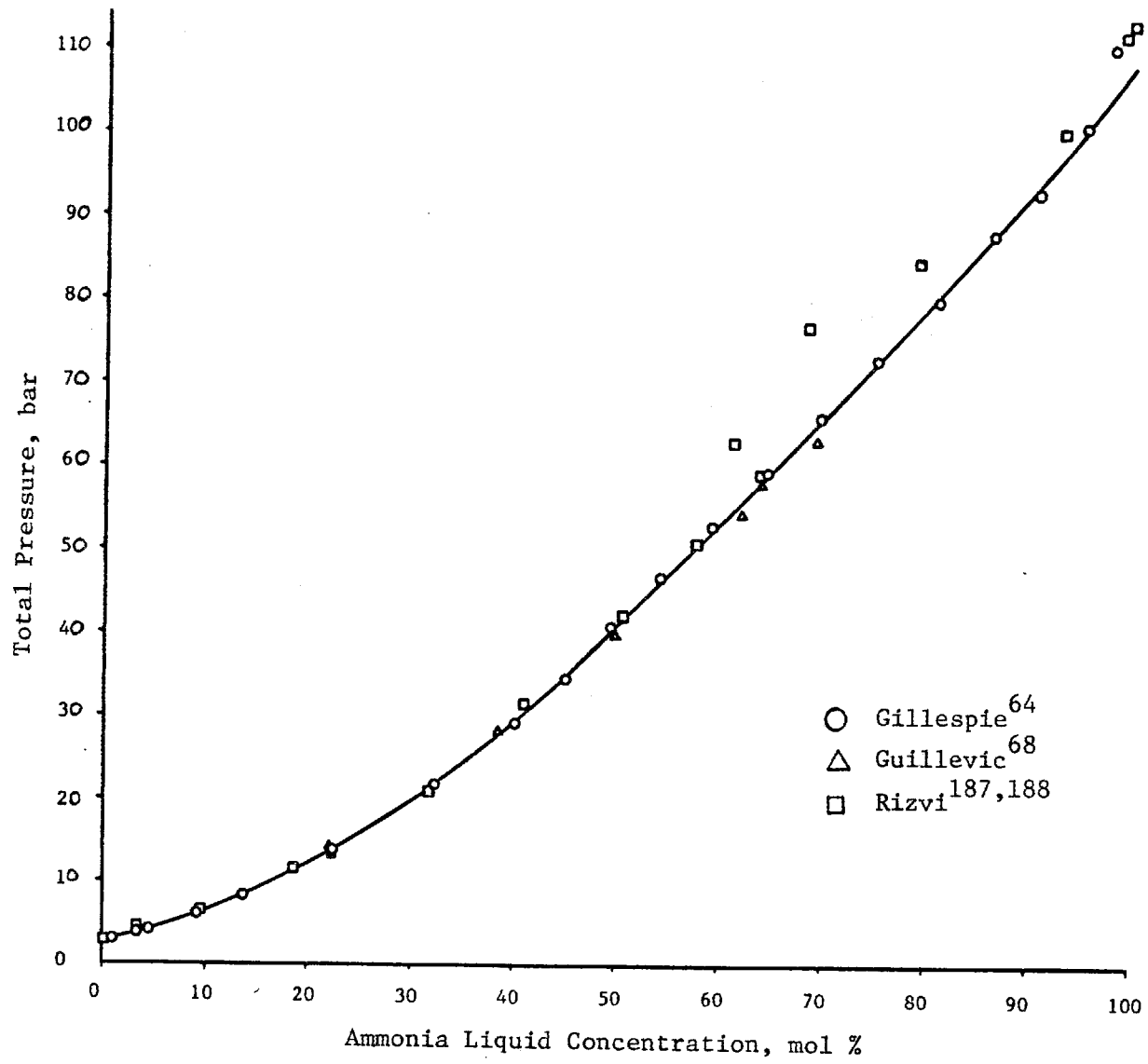

Fig. 26. Comparison of total pressure data at 133°C.

- Macriss et al., ±15.3% (compilation of historical data)
- Clifford and Hunter, ±8.0%.

Comparison of PTxy Data and Thermodynamic Projections

Based on solution total pressure data, Scatchard,[196] and Won[265] made thermodynamic projections of PTxy values. They both concluded that for ammonia rich solutions, the equilibrium water vapor concentrations projected by thermodynamic formulations were significantly lower than reported values (Macriss et al.) and, therefore, the measured vapor concentrations were in error.

In an attempt to reconcile the differences, a comparison was made between the relative volatilities, projected from thermodynamic considerations, presented by Bogart[24] and to data newly obtained by Gillespie et al.,[64] as shown in Fig. 27. The Bogart values at low temperature (40°C) are higher by a factor of 2, than those obtained by Gillespie et al., in the ammonia-rich solution region. Significant deviations occur at other temperatures.

Because the Gillespie et al.[64] values are thermodynamically consistent and have been verified by comparison with experimental data, the conclusion drawn from the comparison is that the thermodynamic projections of Won[187] are not valid.

Comparison of PTxy Data and Polynomial Projections

Several researchers have empirically correlated historical data to provide polynomial relationships for PTxy values to facilitate computer cycle calculations. Three significant efforts are summarized as follows:

- Jain and Gable[94] presented correlations for PTxy values that only applied within a limited range of pressures: 3.5 to 5.5 bar and 17.2 to 24.1 bar
- Electrolux[50] polynomials
- El-Sayed and Tribus[53] presented correlations that covered the pressure and temperature range of 0.07 to 110 bar and -62 to 500°C.

The projected total pressure and PTxy values were compared with measured data to determine the accuracy of each set of polynomials.

The total pressures projected by Electrolux and El-Sayed and Tribus are compared with the smoothed data of Gillespie et al.[64] at 133°C in Fig. 28. Agreement is quite good in the ammonia-lean region (less than 50 mol % ammonia), where deviations between them are much less than 1 bar. However, in the

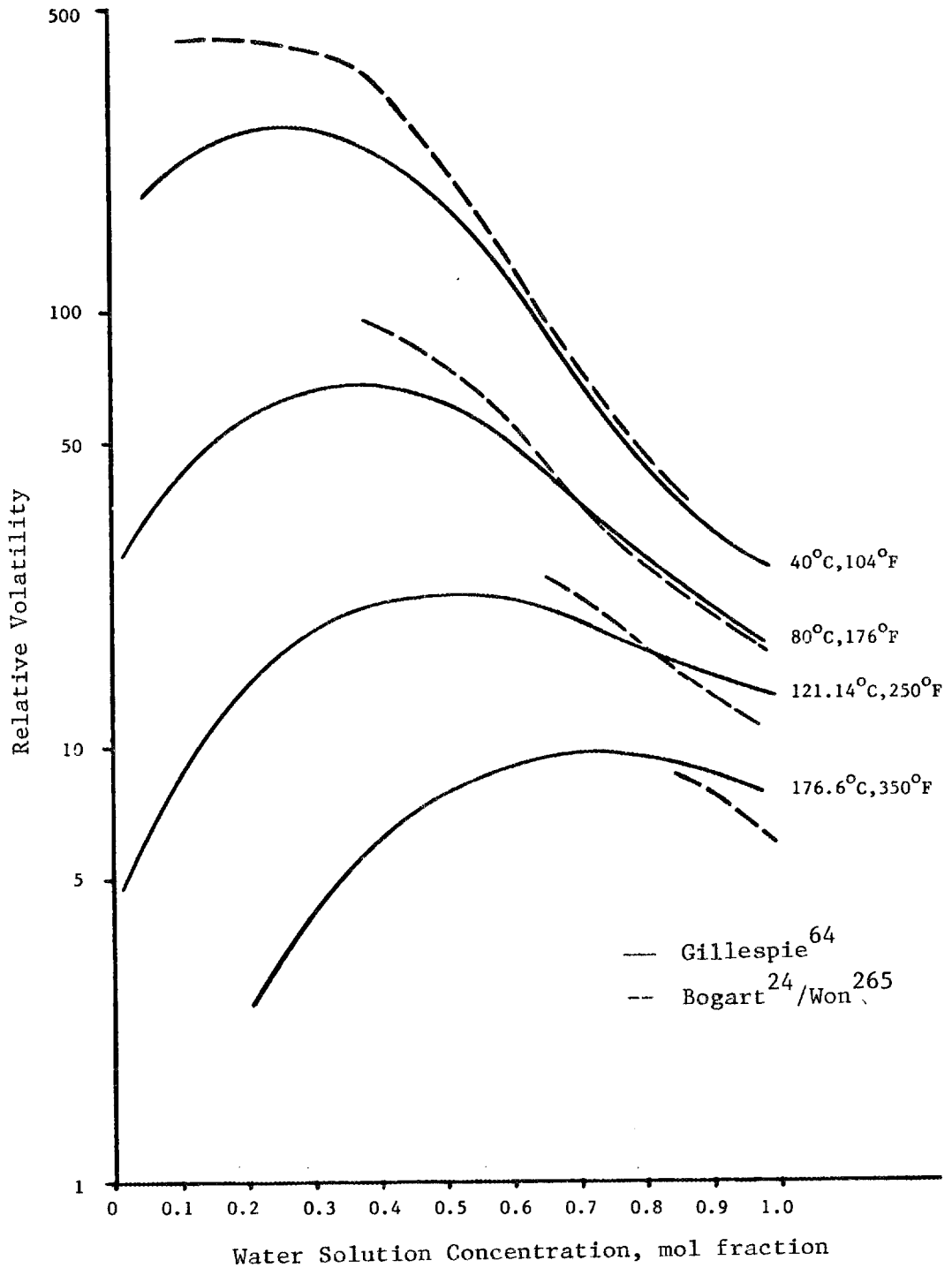

Fig. 27. Comparison of predicted and measured relative volatilities.

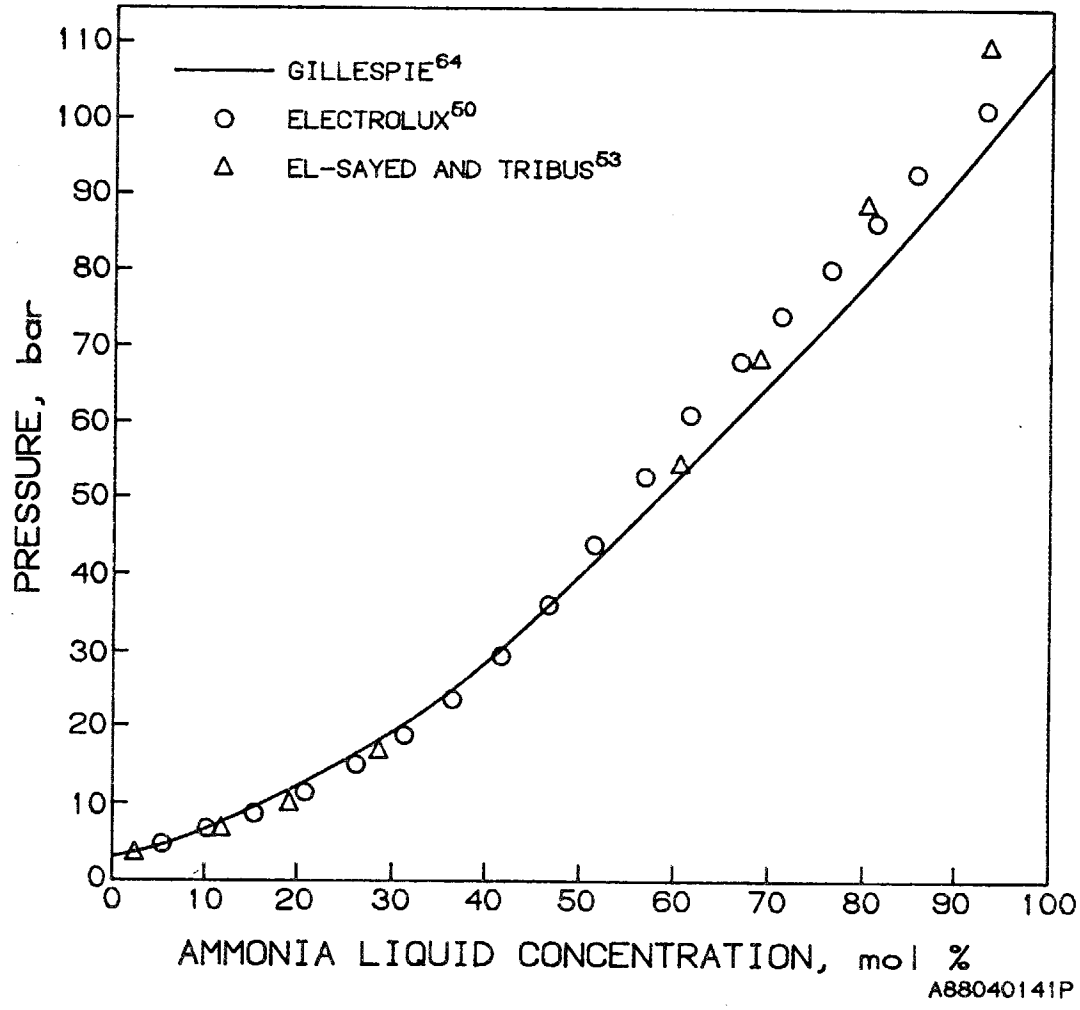

Fig. 28. Comparison of measured and projected pressure at 133°C.

ammonia-rich region, the pressures projected by the polynomials are higher by up to 10 bars than the smoothed measured values.

The relative volatilities are compared in Figs. 29, 30, and 31. The important observations are summarized as follows:

- In a narrow region of application the Jain and Gable polynomials provide accurate estimates of PTxy values (Fig. 29).

- The Electrolux polynomials appear to provide reasonable PTxy estimates at temperatures below 177°C and ammonia-lean solutions (Fig. 30).

  The El-Sayed and Tribus projections appear to best fit the PTxy data in the solution composition range of 40 to 80 mol % water. Significant deviations occur in the very dilute ammonia or ammonia-rich solution concentration range (Fig. 31).

Conclusions

Based on the fine screening analysis:

- The recent data of Gillespie et al. were found to be consistent with historical PTx and PTxy data. Because the Gillespie et al. data are thermodynamically consistent and have covered ranges of temperature, pressure, and solution concentrations heretofore not available, they are selected as the criterion of the usefulness of other thermodynamic and empirical estimating techniques.

- Comparison of thermodynamic projections of PTxy values of Won with those of Gillespie et al. showed the Won projections to be in error for ammonia-rich solutions.

- Comparison of PTxy estimates from polynomial formulations showed that none of the equations could accurately represent the entire range of PTxy data as presented by Gillespie et al. Large discrepancies were found in both the ammonia-rich and lean solution concentrations.

3.5. GAPS IN THE DATA OF KEY FLUIDS

The results of the review and assessment of the U.S. literature data on absorption fluids and the identification of unresolved or potential conflicts in the data provide the basis for the definition of gaps in the existing data base. Additionally, information about the current activity of researchers involved in the development of advanced absorption heat pumps provides some insight as to potential new regimes (temperature, pressure, or concentration) and new fluids for which fluids property data must be known.

A rating system has been devised to be used in assessing the importance of filling the gaps in the data in support of various efforts directed at the identification and development of viable, practical, and commercializable

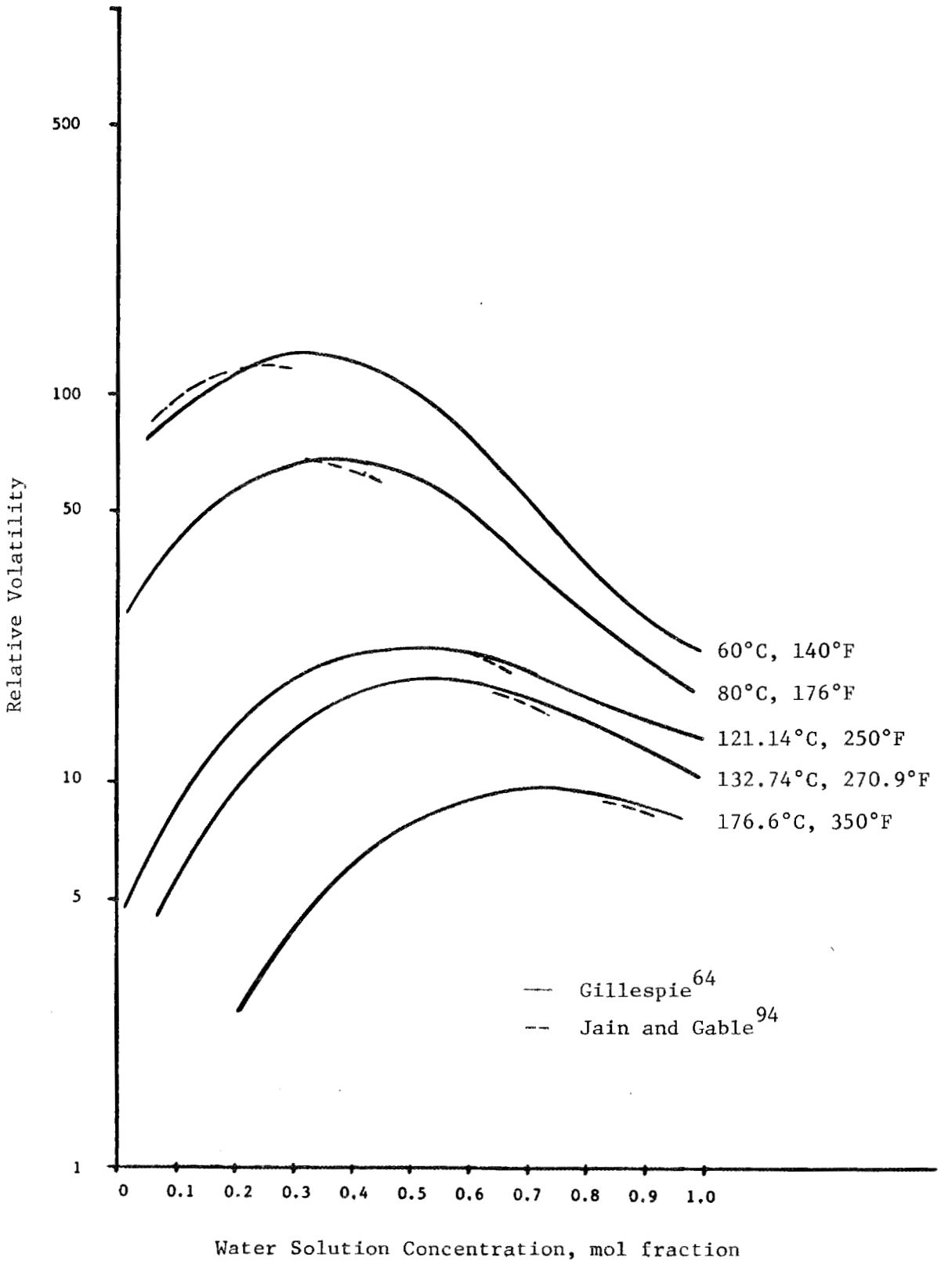

Fig. 29. Comparison of projected and measured relative volatilities.

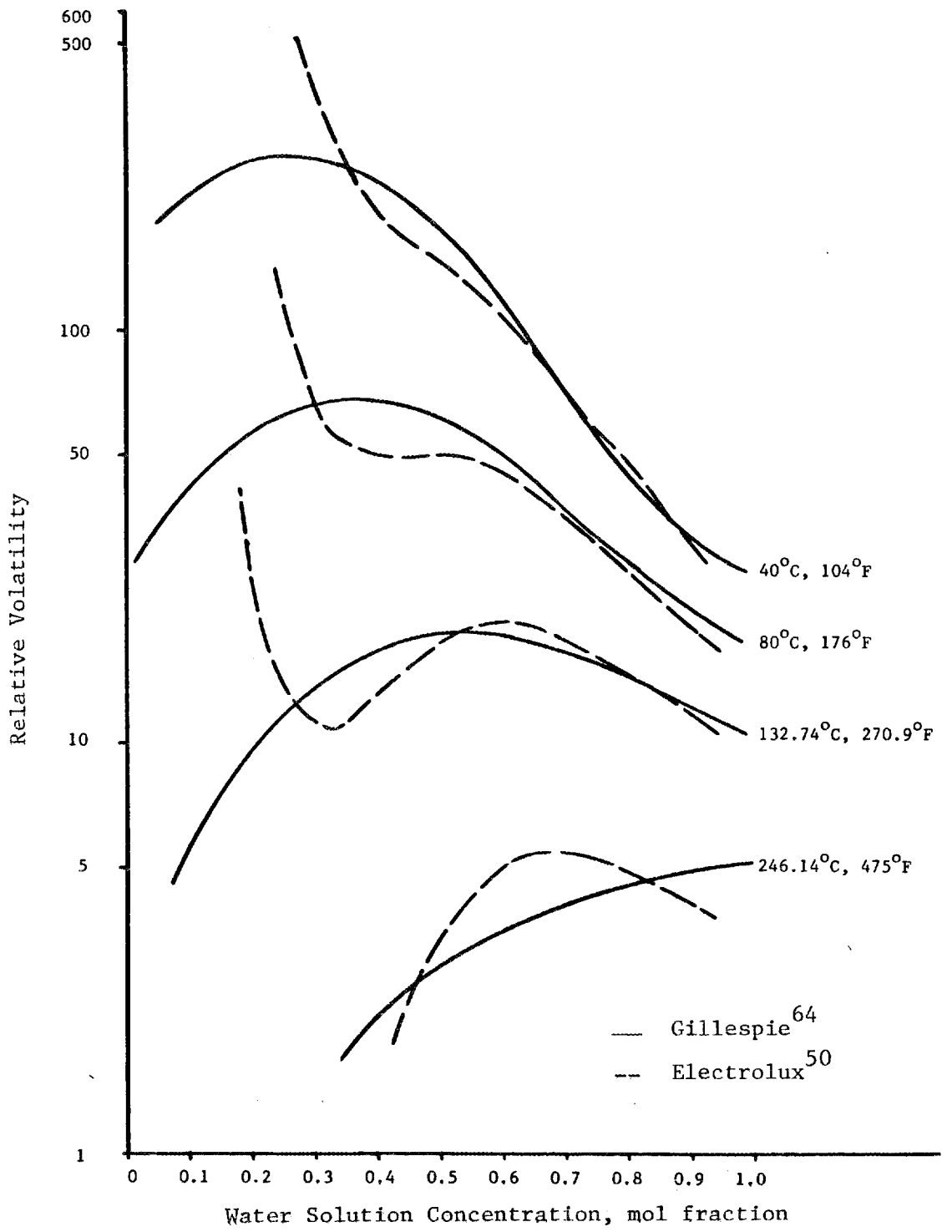

Fig. 30. Comparison of projected and measured relative volatilities.

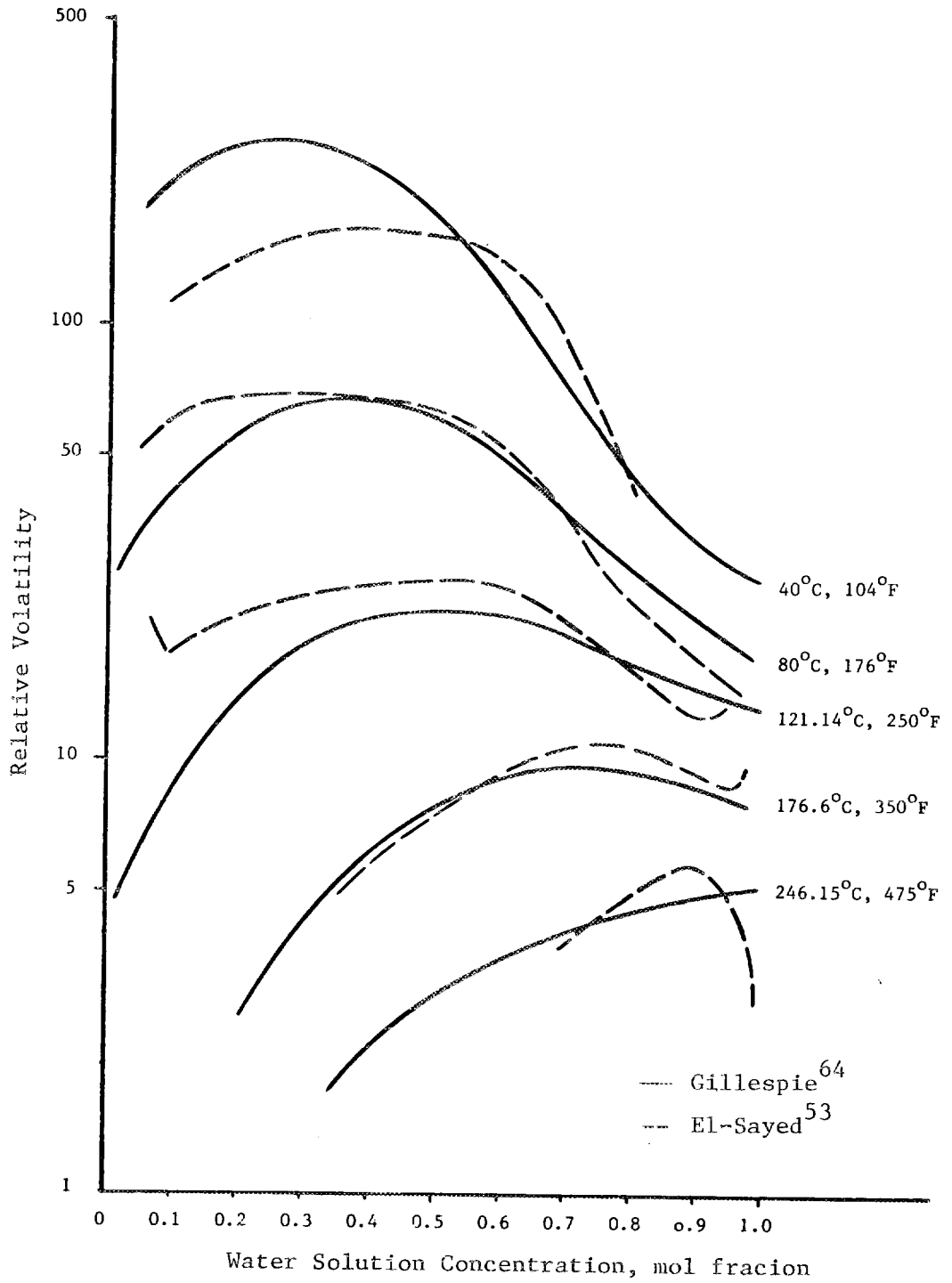

Fig. 31. Comparison of projected and measured relative volatilities.

advanced absorption heat pumps. This rating system addresses data gaps on a fluid-by-fluid basis:

1. Highest Priority: Conflict Resolution or New Data Imperative
2. Conflict Resolution in Data Needed
3. New Data Desirable
Blank. No Fluids Data Action Warranted.

The results of the assessment of gaps in the data for each fluid in this study, using the rating system, are presented in Figs. 32 through 44. The numbers within the grid of each of the figures relate to the level of priority of filling the data gaps relative to a specific fluid and each property of the fluid. A blank grid signifies that no further action is warranted regarding data.

1. Conflict Resolution or New Data Imperative
2. Conflict Resolution in Data Needed
3. New Data Desirable
Blank. No Fluids Data Action Warranted

REFRIGERANTS \ ABSORBENTS	NMP	DMETEG	DMEDEG	DMF	H_2O	LiBr	$ZnBr_2$	NaSCN	LiBr: $ZnBr_2$	LiBr: LiCl	LiBr: H_2O	LiBr: LiSCN	$LiNO_3$: H_2O	NaOH: KOH: CsOH	$LiNO_3$: $NaNO_3$: KNO_3
R-21	3	2	3	3											
R-22	1	3	1	3											
R-123a	1	3	3	3											
R-124	1	3	3	3											
R-133a	3	3	3	3											
CH_3OH						2	3		3						
CH_3NH_2								2			3				
TFE	3	3	3												
NH_3					1			3			1	3	3		
H_2O									3	1				3	3

Fig. 32. Gaps in vapor-liquid equilibrium data for key fluids.

1. Conflict Resolution or New Data Imperative
2. Conflict Resolution in Data Needed
3. New Data Desirable
Blank. No Fluids Data Action Warranted

REFRIGERANTS \ ABSORBENTS	ETFE	NMP	DMETEG	DMEDEG	DMF	H_2O	LiBr	$ZnBr_2$	NaSCN	LiBr: $ZnBr_2$	LiBr: LiCl	LiBr: H_2O	LiBr: LiSCN	$LiNO_3$: H_2O	NaOH: KOH: CsOH	$LiNO_3$: $NaNO_3$: KNO_3
R-21																
R-22																
R-123a																
R-124																
R-133a																
CH_3OH							3	3	3	3	3					
CH_3NH_2																
TFE																
NH_3												1		1		
H_2O											1		1		3	3

Fig. 33. Gaps in crystallization temperature data for key fluids.

1. Conflict Resolution or New Data Imperative
2. Conflict Resolution in Data Needed
3. New Data Desirable
Blank. No Fluids Data Action Warranted

REFRIGERANTS \ ABSORBENTS	EFTE	NMP	DMETEG	DMEDEG	DMF	H_2O	LiBr	$ZnBr_2$	NaSCN	LiBr: $ZnBr_2$	LiBr: LiCl	LiBr: H_2O	LiBr: LiSCN	$LiNO_3$: H_2O	NaOH: KOH: CsOH	$LiNO_3$: $NaNO_3$: KNO_3
R-21	3	3	3	3	3											
R-22		3	3	3	3											
R-123a	3	3	3	3	3											
R-124		3	3	3	3											
R-133a	3	3	3	3	3											
CH_3OH																
CH_3NH_2									3			1				
TFE		3	3		3											
NH_3						2			3			1		1		
H_2O											1		1	1	1	1

Fig. 34. Gaps in corrosion data for key fluids.

1. Conflict Resolution or New Data Imperative
2. Conflict Resolution in Data Needed
3. New Data Desirable
Blank. No Fluids Data Action Warranted

REFRIGERANTS \ ABSORBENTS	EFTE	NMP	DMETEG	DMEDEG	DMF	H_2O	LiBr	$ZnBr_2$	NaSCN	LiBr: $ZnBr_2$	LiBr: LiCl	LiBr: H_2O	LiBr: LiSCN	$LiNO_3$: H_2O	NaOH: KOH: CsOH	$LiNO_3$: $NaNO_3$: KNO_3
R-21																
R-22		3	3	3	3											
R-123a	3	3	3	3	3											
R-124	2	3	3	3	3											
R-133a		3	3	3	3											
CH_3OH		1	1	1												
CH_3NH_2																
TFE																
NH_3																
H_2O															1	1

Fig. 35. Gaps in toxicity data for key fluids.

1. Conflict Resolution or New Data Imperative
2. Conflict Resolution in Data Needed
3. New Data Desirable
Blank. No Fluids Data Action Warranted

REFRIGERANTS \ ABSORBENTS	EFTE	NMP	DMETEG	DMEDEG	DMF	H_2O	LiBr	$ZnBr_2$	NaSCN	LiBr: $ZnBr_2$	LiBr: LiCl	LiBr: H_2O	LiBr: LiSCN	$LiNO_3$: H_2O	NaOH: KOH: CsOH	$LiNO_3$: $NaNO_3$: KNO_3
R-21																
R-22		1	1	1	3											
R-123a	1	3	3	3	3											
R-124		3	3	3	3											
R-133a		1	1	3	3											
CH_3OH										1						
CH_3NH_2									1			1				
TFE		1	1	1												
NH_3						3			1			1		1		
H_2O							1				1		1		1	1

Fig. 36. Gaps in heat and mass transfer data for key fluids.

1. Conflict Resolution or New Data Imperative
2. Conflict Resolution in Data Needed
3. New Data Desirable
Blank. No Fluids Data Action Warranted

REFRIGERANTS \ ABSORBENTS	EFTE	NMP	DMETEG	DMEDEG	DMF	H_2O	LiBr	$ZnBr_2$	NaSCN	LiBr: $ZnBr_2$	LiBr: LiCl	LiBr: H_2O	LiBr: LiSCN	$LiNO_3$: H_2O	NaOH: KOH: CsOH	$LiNO_3$: $NaNO_3$: KNO_3
R-21																
R-22		2	3	3												
R-123a		3	3	3	3											
R-124		3	3	3	3											
R-133a		3	3	3	3											
CH_3OH							2			3						
CH_3NH_2									1			1				
TFE		2	2	2												
NH_3						1						1		1		
H_2O							3						1		1	1

Fig. 37. Gaps in viscosity data for key fluids.

1. Conflict Resolution or New Data Imperative
2. Conflict Resolution in Data Needed
3. New Data Desirable
Blank. No Fluids Data Action Warranted

REFRIGERANTS \ ABSORBENTS	EFTE	NMP	DMETEG	DMEDEG	DMF	H_2O	LiBr	$ZnBr_2$	NaSCN	LiBr: $ZnBr_2$	LiBr: LiCl	LiBr: H_2O	LiBr: LiSCN	$LiNO_3$: H_2O	NaOH: KOH: CsOH	$LiNO_3$: $NaNO_3$: KNO_3
R-21																
R-22		1	1	1												
R-123a		3	3	3	3											
R-124		3	3	3	3											
R-133a		3	3	3	3											
CH_3OH							3			1						
CH_3NH_2												3				
TFE		1	1	1												
NH_3						1						3		1		
H_2O							3						1		1	1

Fig. 38. Gaps in vapor- and liquid-phase enthalpy data for key fluids.

1. Conflict Resolution or New Data Imperative
2. Conflict Resolution in Data Needed
3. New Data Desirable
Blank. No Fluids Data Action Warranted

REFRIGERANTS \ ABSORBENTS	EFTE	NMP	DMETEG	DMEDEG	DMF	H_2O	LiBr	$ZnBr_2$	NaSCN	LiBr: $ZnBr_2$	LiBr: LiCl	LiBr: H_2O	LiBr: LiSCN	$LiNO_3$: H_2O	NaOH: KOH: CsOH	$LiNO_3$: $NaNO_3$: KNO_3
R-21																
R-22	3	3	3													
R-123a		3	3	3	3											
R-124		3	3	3	3											
R-133a		3	3	3	3											
CH_3OH										3						
CH_3NH_2									3			3				
TFE	3	3	3													
NH_3						1			3			3		2		
H_2O							3				1		1		1	1

Fig. 39. Gaps in thermal conductivity data for key fluids.

1. Conflict Resolution or New Data Imperative
2. Conflict Resolution in Data Needed
3. New Data Desirable
Blank. No Fluids Data Action Warranted

REFRIGERANTS \ ABSORBENTS	EFTE	NMP	DMETEG	DMEDEG	DMF	H_2O	LiBr	$ZnBr_2$	NaSCN	LiBr: $ZnBr_2$	LiBr: LiCl	LiBr: H_2O	LiBr: LiSCN	$LiNO_3$: H_2O	NaOH: KOH: CsOH	$LiNO_3$: $NaNO_3$: KNO_3
R-21																
R-22		3	3	3												
R-123a		3	3	3	3											
R-124		3	3	3	3											
R-133a		3	3	3	3											
CH_3OH										3						
CH_3NH_2									2			3				
TFE		3	3	3												
NH_3						1			3		1	3				
H_2O							1						3		1	1

Fig. 40. Gaps in specific heat data for key fluids.

1. Conflict Resolution or New Data Imperative
2. Conflict Resolution in Data Needed
3. New Data Desirable
Blank. No Fluids Data Action Warranted

REFRIGERANTS \ ABSORBENTS	EFTE	NMP	DMETEG	DMEDEG	DMF	H_2O	LiBr	$ZnBr_2$	NaSCN	LiBr: $ZnBr_2$	LiBr: LiCl	LiBr: H_2O	LiBr: LiSCN	$LiNO_3$: H_2O	NaOH: KOH: CsOH	$LiNO_3$: $NaNO_3$: KNO_3
R-21																
R-22		3	3	3												
R-123a																
R-124																
R-133a																
CH_3OH										3						
CH_3NH_2									3			3				
TFE		3	3	3												
NH_3							1					3		2		
H_2O							3				1		1		1	1

Fig. 41. Gaps in density data for key fluids.

1. Conflict Resolution or New Data Imperative
2. Conflict Resolution in Data Needed
3. New Data Desirable
Blank. No Fluids Data Action Warranted

REFRIGERANTS \ ABSORBENTS	EFTE	NMP	DMETEG	DMEDEG	DMF	H_2O	LiBr	$ZnBr_2$	NaSCN	LiBr: $ZnBr_2$	LiBr: LiCl	LiBr: H_2O	LiBr: LiSCN	$LiNO_3$: H_2O	NaOH: KOH: CsOH	$LiNO_3$: $NaNO_3$: KNO_3
R-21																
R-22		3	3	3												
R-123a		3	3	3	3											
R-124		3	3	3	3											
R-133a		3	3	3	3											
CH_3OH										3						
CH_3NH_2									3			3				
TFE		3	3	3												
NH_3						1						3		1		
H_2O							3						3		1	1

Fig. 42. Gaps in stability data for key fluids.

1. Conflict Resolution or New Data Imperative
2. Conflict Resolution in Data Needed
3. New Data Desirable
Blank. No Fluids Data Action Warranted

REFRIGERANTS \ ABSORBENTS	EFTE	NMP	DMETEG	DMEDEG	DMF	H_2O	LiBr	$ZnBr_2$	NaSCN	LiBr: $ZnBr_2$	LiBr: LiCl	LiBr: H_2O	LiBr: LiSCN	$LiNO_3$: H_2O	NaOH: KOH: CsOH	$LiNO_3$: $NaNO_3$: KNO_3
R-21																
R-22		1	1	1												
R-123a		3	3	3	3											
R-124		3	3	3	3											
R-133a		3	3	3	3											
CH_3OH																
CH_3NH_2												1				
TFE		1	1	1												
NH_3						3						1		1		
H_2O											1		1		1	1

Fig. 43. Gaps in heat transfer additive data for key fluids.

1. Conflict Resolution or New Data Imperative
2. Conflict Resolution in Data Needed
3. New Data Desirable
Blank. No Fluids Data Action Warranted

REFRIGERANTS \ ABSORBENTS	EFTE	NMP	DMETEG	DMEDEG	DMF	H_2O	LiBr	$ZnBr_2$	NaSCN	LiBr: $ZnBr_2$	LiBr: LiCl	LiBr: H_2O	LiBr: LiSCN	$LiNO_3$: H_2O	NaOH: KOH: CsOH	$LiNO_3$: $NaNO_3$: KNO_3
R-21																
R-22		3	3	3	3											
R-123a		3	3	3	3											
R-124		3	3	3	3											
R-133a		3	3	3	3											
CH_3OH																
CH_3NH_2												1				
TFE																
NH_3						3			3			1		1		
H_2O											1		1		1	1

Fig. 44. Gaps in corrosion inhibitor data for key fluids.

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6. APPENDIX. FLUIDS, PROPERTIES, DATA, AND RANGE OF CONDITIONS

Table A.1.0. AMMONIA BINARY AND MULTICOMPONENT ABSORPTION FLUIDS PROPERTIES DATA

A.1.1. Vapor-Liquid Equilibrium

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$NH_3 + H_2O$	TE	6-100	0.24-1.705	0.50-18.97 6.14-90	38	Clifford	1933	England	English
$NH_3 + H_2O$	TE	97-147	0.899-16.3	0-25.9 0-89.76	38	Clifford	1933	England	English
$NH_3 + H_2O$	GE	60-147	0.24-16.3	0-90 0-100	38	Clifford	1933	England	English
$NH_3 + H_2O$	GS	-100-180	0.02-10	0-100 0-100	38	Clifford	1933	England	English
$NH_3 + H_2O$	TS	-83-150	0.02-19.2	0-100 0-100	38	Clifford	1933	England	English
$NH_3 + H_2O$	TGE	0-61.3	11.5-1801.6 (1)	4.21-34.75	166	Perman	1901	England	English
$NH_3 + H_2O$	TS	0-61.3	5-1842 (1)	0-35	166	Perman	1901	England	English
$NH_3 + H_2O$	TE	-40-260	0.04-48.39	0-40	167	Pierre	1901	Sweden	English
$NH_3 + H_2O$	GE	-40-175	0.2-20	0-100	266	Wucherer	1932	Germany	German

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.1.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$NH_3 + H_2O$	GE	-20-140	0.2-20	Y=0-100	266	Wucherer	1932	Germany	German
$NH_3 + H_2O$	GS	-50-210	0.2-20	0-100 0-100	266	Wucherer	1932	Germany	German
$NH_3 + H_2O$	TS	-50.5-211.4	0.1-20	0-100	266	Wucherer	1932	Germany	German
$NH_3 + H_2O$	TS	-6.2-202.7	0.2-20	Y=15-99	266	Wucherer	1932	Germany	German
$NH_3 + H_2O$	TS	NA	0.2-20	0.2-100 10.5-100	266	Wucherer	1932	Germany	German
$NH_3 + H_2O$	GTE	1.38-120.12	758-7000 (1)	11.8-50.4	145	Mollier	1908	Germany	German
$NH_3 + H_2O$	GS	20-150	0-10	0-50	145	Mollier	1908	Germany	German
$NH_3 + H_2O$	GS	20-180	1-10	0-50	145	Mollier	1908	Germany	German
$NH_3 + H_2O$	TS	20-150	1-10	0.15-52.7	145	Mollier	1908	Germany	German
$NH_3 + H_2O$	TS	20-150	1.08-10.20	5-50	145	Mollier	1908	Germany	German
$NH_3 + H_2O$	CP	-70-175	0.01-25	NA	199	Schulz	1971	Germany	English
$NH_3 + H_2O$	CP	-70-175	0.01-25	0-100	197	Schulz	1971	Germany	German

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Table A.1.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$NH_3 + H_2O$	CP	-40-220	0.2-50	0-100	276	Ziegler	1982	Switzerland	German
$NH_3 + H_2O$	GCP	-40-220	0.2-50	0-100	276	Ziegler	1982	Switzerland	German
$NH_3 + H_2O$	CP	-40-220	0.2-50	0-100	277	Ziegler	1984	Switzerland	English
$NH_3 + H_2O$	GCP	-40-220	0.2-50	0-100	277	Ziegler	1984	Switzerland	English
$NH_3 + H_2O$	GC	-200-227	0.7-34.47	0-100	146	Morel	1983	France	French
$NH_3 + H_2O$	GCP	NA	NA	NA	59	Fischer	1935	Germany	German
$NH_3 + H_2O$	P	NA	NA	NA	50	Electrolux	1970	Sweden	English
$NH_3 + H_2O$	TEG	130-230	7-72	7.2-68.5 18.6-97.3	68	Guillevic	1983	France	French
$NH_3 + H_2O$	TE	0-91	0.021-11.7	8.5-84.3 60.2-(265)[c]	264	Wilson	1925	U.S.A.	English
$NH_3 + H_2O$	TE	61-117	15.3-35.9	Y = 96.0-99.5	122	Macriss	1964	U.S.A.	English
$NH_3 + H_2O$	GTS	-76-243	0.069-34.5	0.0-100.0 0.0-100.0	123	Macriss	1964	U.S.A.	English

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c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.1.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$NH_3 + H_2O$	TE	91-147	1.01, 4.48	0.09-3.62 7.5-30.7	174	Polak	1975	U.S.A.	English
$NH_3 + H_2O$	TC	-51-188	0.018-23.4	9.5-89.5 43.4-(0.66)[c]	196	Scatchard	1947	U.S.A.	English
$NH_3 + H_2O$	GC	16-77	NA	NA	45	Edwards	1978	U.S.A.	English
$NH_3 + H_2O$	GC	-46-116	0.021-34.5	9.5-89.5 9.5-(1.0)[c]	265	Won	1980	U.S.A.	English
$NH_3 + H_2O$	CP	-6-7 43-56	3.45-5.52 17.24-24.13	NA	94	Jain	1971	U.S.A.	English
$NH_3 + H_2O$	TC	-50-214	0.414-20.7	0.14-99.5 1.08-(1.43)[c]	24	Bogart	1980	U.S.A.	English
$NH_3 + H_2O$	TS	-76-214	0.069-20.7	0.0-100.0 0.0-100.0	96	Jennings	1965	U.S.A.	English
$NH_3 + H_2O$	TE GS	40-316	0.07-210	0.0-100.0 0.0-100.0	64	Gillespie	1985	U.S.A.	English
$NH_3 + H_2O$	TEG	33-345	0.05-218	0.0-100.0 0.0-100.0	187	Rizvi	1985	Canada	English

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Table A.1.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$NH_3 + H_2O$	TEG	33-345	0.05-218	0.0-100.0 0.0-100.0	188	Rizvi	1987	Canada	English
$NH_3 + H_2O$	GES	97-350	1-220	0.0-100.0 0.0-100.0	223	Tsiklis	1965	U.S.S.R.	English
$NH_3 + H_2O$	GC	0-65	0.01-30	10.0-90.0	149	Munsch	1978	Germany	English
$NH_3 + H_2O$	GC	-125-175	0.1-8000 (1)	12.0-87.6	112	Kracek	1930	U.S.A.	English
$NH_3 + H_2O$	GC	-23	1241 (1)	0-100	112	Kracek	1930	U.S.A.	English
$NH_3 + H_2O$	TC	-99.07- 192.78	0.1-10000 (1)	0-100	112	Kracek	1930	U.S.A.	English
$NH_3 + H_2O$	TC	-90-180	0.31-10000 (1)	0-100	112	Kracek	NA	U.S.A.	English
$NH_3 + H_2O$	GS	0-210	0.5-20	0-100	51	Ellerwald	1981	Germany	German
$NH_3 + H_2O$	TEP	50-250	1.09-83.5	8.84-97.25	51	Ellerwald	1981	Germany	German
$NH_3 + H_2O$	PTS	-34-211	0.5-19.6	0-100	269	Zatorskii	1978	U.S.S.R.	Russian
$NH_3 + H_2O$	P	-62-499	0.07-109	0.0-100.0 0.0-100.0	53	El-Sayed	1985	U.S.A.	English

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Table A.1.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
NH_3 + $LiNO_3$	TE	40-125	1-16	33.7	62	Gensch	1937	Germany	German
NH_3 + $LiNO_3$	TE	-10-130	0.2-13.8	32.6-100	21	Blytas	1961	U.S.A.	English
NH_3 + NaSCN	TGE	-20-90	0.34-49.64	42.2-100.0	23	Blytas	1962	U.S.A.	English
NH_3 + NaSCN	TE	25-100	1.01-29.23	34.4-53.0	189	Roberson	1965	U.S.A.	English
NH_3 + LiSCN	GTEP	28-104	1.06-15.40	40.2-61.6	128	Macriss	1971	U.S.A.	English
NH_3 + LiSCN	GE	35-100	1.19-11.65	41.4-54.4	19	Biermann	1978	U.S.A.	English
NH_3 + NH_4I	TE	25-100	1.68-49.16	25.6-50.3	190	Roberson	1966	U.S.A.	English
NH_3 + NH_4I	TS	20-120	2.34-54.61	29.9-39.9	63	George	1965	U.S.A.	English
NH_3 + NaBr	TE	25-100	3.58-53.85	39.6-60.6	190	Roberson	1966	U.S.A.	English
NH_3 + NH_4Br	TE	25-100	2.94-51.16	31.3-51.6	190	Roberson	1966	U.S.A.	English
NH_3 + NaI	TE	25-100	3.42-57.23	37.1-63.6	190	Roberson	1966	U.S.A.	English
NH_3 + DMETEG	TE	30-100	1.65-35.78	1.5-17.6	190	Roberson	1966	U.S.A.	English
NH_3 + DMETrEG	TE	30-100	1.16-36.37	1.2-20.9	190	Roberson	1966	U.S.A.	English

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Table A.1.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
NH_3 + 1, 4 - Butanediol	TE	30-100	0.22-25.92	2.2-26.3	190	Roberson	1966	U.S.A.	English
NH_3 + 2, 3 - Butanediol	TE	30-100	0.54-30.13	2.6-30.6	190	Roberson	1966	U.S.A.	English
NH_3 + TEG	TE	30-100	0.16-38.31	1.2-30.4	190	Roberson	1966	U.S.A.	English
NH_3 + Polydi-methylsiloxane	GE	30	7.23-11.72	2.0-6.0	190	Roberson	1966	U.S.A.	English
NH_3 + Nitro-benzen	TE	30-100	3.10-35.30	2.0-13.5	147	Morrone	1962	U.S.A.	English
NH_3 + Octyl-amine	TE	30-100	2.55-36.89	2.5-33.6	147	Morrone	1962	U.S.A.	English
NH_3 + DMA	TE	30-100	1.79-40.75	3.2-37.8	147	Morrone	1962	U.S.A.	English
NH_3 + Aniline	TE	30-100	2.21-21.93	5.4-38.9	147	Morrone	1962	U.S.A.	English
NH_3 + H_2O:LiBr (2:3) (W)	TGS GE	-80-300	1-30	0-100 0-100	177	Radermacher	1981	Germany	English

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(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.1.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$NH_3 + H_2O$:LiBr (2:3)(W)	GS	-20-200	1-30	0-100	176	Radermacher	1981	Germany	English
$NH_3 + H_2O$:LiBr (2:3)(W)	GS	-80-300	1-30	0-100	178	Radermacher	1982	Germany	German
$NH_3 + LiNO_3$: H_2O (3:1)(W)	TEP	-30-200	0.5-27	16-100	47	Ehmke	1984	Germany	German
$NH_3 + LiNO_3$: H_2O (3:1)(W)	TGS	20-200	0.5-25	16-100	47	Ehmke	1984	Germany	German
$NH_3 + LiNO_3$: H_2O (3:1)(W)	GS	-20-200	0.5-25	16-100	26	Bokelmann	1984	Germany	English
$NH_3 + LiNO_3$: H_2O (3:1)(W)	GS	-20-200	0.5-25	16-100	32	Bokelmann	1985	Germany	English
NH_3 + NaSCN: NaI (0.5:1)(W)	TE	25-100	0.48-55.92	27.2-69.1	190	Roberson	1966	U.S.A.	English
NH_3 + NaSCN: NaI (2:1)(W)	TE	25-100	1.18-40.84	34.7-56.9	190	Roberson	1966	U.S.A.	English

X - Liquid Phase
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(1) - mmHg

R - Refrigerant
A - Absorbent(s)
(2) - mbar

c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.1.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$NH_3 + H_2O:CrO_3$	TE	70-260	9.9-47.84	4-45	167	Pierre	1901	Sweden	English
$NH_3 + LiNO_3$: 1,4 BDL (0.77:1 to 9.0:1)(W)	TE	35 & 50	0.15-2.00	7.7-33.1	224	Tsimbalist	1983	U.S.S.R.	English
$NH_3 + LiNO_3$: 1,6 HDL (2.7:1, 7.4:1)(W)	TE	35 & 50	0.15-2.00	21.9-37.4	224	Tsimbalist	1983	U.S.S.R.	English
NH_3 + 1, 4 Butanediol: NaSCN (6.04:1) (M)	TE	30-100	0.93-37.58	10.4-48.9	190	Roberson	1966	U.S.A.	English
NH_3 + 1, 4 Butanediol: NaSCN (13.29:1) (M)	TE	30-100	1.53-39.16	12.0-40.9	190	Roberson	1966	U.S.A.	English
NH_3 + 1, 4 Butanediol:NaI (4.99:1)(M)	TE	30-100	1.08-41.78	10.4-39.3	190	Roberson	1966	U.S.A.	English

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(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.1.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
NH_3 + 1, 4 Butanediol:NH_4I (4.85:1)(M)	TE	30-100	1.02-36.60	10.7-38.5	190	Roberson	1966	U.S.A.	English
NH_3 + 1, 4 Butanediol:NH_4I (8.17:1)(M)	TE	30-100	3.61-42.81	20.9-40.7	190	Roberson	1966	U.S.A.	English
NH_3 + TEG: NaSCN (1.26:1) (M)	TE	30-100	1.99-24.48	10.4-20.3	190	Roberson	1966	U.S.A.	English
NH_3 + 1, 4 Butanediol: NaI:NaSCN (11.0:1:2)(M)	TE	30-100	1.29-18.48	12.3-22.5	190	Roberson	1966	U.S.A.	English
NH_3 + 1, 4 Butanediol: NaI:NaSCN (12.94:1:1)(M)	TE	30-100	1.26-17.51	13.1-61.2	190	Roberson	1966	U.S.A.	English
A.1.2. Crystallization Temperature									
NH_3 + H_2O	GS	-100-180	0.02-10	0-100 0-100	38	Clifford	1933	England	English

X - Liquid Phase
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R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.1.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$NH_3 + H_2O$	GS	-151-0	NA	0.0-100.0	123	Macriss	1964	U.S.A.	English
$NH_3 + H_2O$	TGE	0 - -110	1	0-100	142	Mironov	1955	U.S.S.R.	English
$NH_3 + H_2O$	GC	-100-0	NA	0-100	112	Kracek	NA	U.S.A.	English
$NH_3 + H_2O$	GE	25-75	NA	25-40	27	Bokelmann	1983	Germany	English
$NH_3 + H_2O$	GS	0-130	NA	0-100	181	Renz	1978	Germany	German
$NH_3 + H_2O$	GE	25-75	NA	25-40	46	Ehmke	1983	Germany	English
$NH_3 + NaSCN$	GE	-90-305	NA	0.0-100.0	23	Blytas	1962	U.S.A.	English
$NH_3 + LiNO_3$	GE	5-35	NA	28.8-38.3	225	Tsimbalist	1983	U.S.S.R.	English
$NH_3 + LiNO_3$	GS	0-80	NA	30-100	181	Renz	1978	Germany	German
$NH_3 + LiNO_3$	TE	NA	0.264-0.313	15-19	13	Baldi	1971	Italy	Italian
$NH_3 + LiCl$	TE	NA	0.251-0.574	15-23	13	Baldi	1971	Italy	Italian
$NH_3 + Li_2SO_4$	TE	NA	0.303-0.459	15-19	13	Baldi	1971	Italy	Italian
$NH_3 + KNO_3$	TE	NA	0.293-0.593	15-22	13	Baldi	1971	Italy	Italian

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(2) - mbar
c - ppm by weight of A in Vapor Phase
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NA - Not Available

Table A.1.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
NH_3 + KCl	TE	NA	0.314-0.503	15-21	13	Baldi	1971	Italy	Italian
NH_3 + KBr	TE	NA	0.286-0.474	14-19	13	Baldi	1971	Italy	Italian
NH_3 + NaBr	TE	NA	0.332-0.591	16-21	13	Baldi	1971	Italy	Italian
NH_3 + NaCl	TE	NA	0.188-0.351	11-17	13	Baldi	1971	Italy	Italian
NH_3 + $NaNO_3$	TE	NA	0.312-0.359	15-16	13	Baldi	1971	Italy	Italian
NH_3 + Na_2SO_4	TE	NA	0.351-0.359	16-17	13	Baldi	1971	Italy	Italian
NH_3 + $LiNO_3$: H_2O (0.73:1 to ∞)(W)	TE GS	5-35	NA	0.9-29.1	225	Tsimbalist	1983	U.S.S.R.	English
NH_3 + $LiNO_3$: H_2O (2.3:1 to ∞)	GE	0-60	NA	10-40	46	Ehmke	1983	Germany	English
NH_3 + $LiNO_3$: 1,4 BDL (0.77:1 to 9.0:1)(W)	GS	35 & 50	0.15-2	7.7-33.1	224	Tsimbalist	1983	U.S.S.R.	English
NH_3 + $LiNO_3$: 1,6 HDL (2.7:1, 7.4:1)(W)	GS	35 & 50	0.15-2	21.9-37.4	224	Tsimbalist	1983	U.S.S.R.	English

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(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.1.0. (Cont.)

A.1.3. Corrosion

Fluid System	Data Type	Temp. Range, °C	Corrosion Inhibitor, wt %	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$NH_3 + H_2O$:LiBr	TE	200	None	10	67	Griess	1985	U.S.A.	English

A.1.4. Heat of Mixing

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$NH_3 + H_2O$	TE	10.5-15	1	9.5-78.8	144	Mollier	1909	Germany	German
$NH_3 + H_2O$	GE	15	1	0-60	144	Mollier	1909	Germany	German
$NH_3 + H_2O$	GC	100	NA	0-100	149	Munsch	1978	Germany	English
$NH_3 + H_2O$	TE	12 & 10	NA	0-100	232	Uemura	1977	Japan	Japanese
$NH_3 + H_2O$	GTE	NA	NA	18.0-80.34	14	Baud	1909	France	French
$NH_3 + H_2O$	TE	NA	NA	18.0-80.34	15	Baud	1909	France	French
$NH_3 + H_2O$	GS	NA	NA	0-100	278	Zinner	1934	Germany	German
$NH_3 + H_2O$	GCP	NA	NA	NA	59	Fischer	1945	Germany	German

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(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.1.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$NH_3 + LiNO_3$	GS	0-180	0.22-15.85	24-40	62	Gensch	1937	Germany	German
$NH_3 + LiSCN$	PC	28-104	1.06-15.40	40.2-61.6	128	Macriss	1971	U.S.A.	English
$NH_3 + NaSCN$	TE	0	NA	52.4-95.4	23	Blytas	1962	U.S.A.	English
NH_3 + DMETEG	C	NA	NA	NA	226	Tyagi	1976	Japan	English
NH_3 + DMETrEG	C	NA	NA	NA	226	Tyagi	1976	Japan	English
NH_3 + TEG	C	NA	NA	NA	226	Tyagi	1976	Japan	English
NH_3 + BDL	C	NA	NA	NA	226	Tyagi	1976	Japan	English
NH_3 + BDL	C	NA	NA	NA	226	Tyagi	1976	Japan	English
A.1.5. Liquid-Phase Densities									
$NH_3 + H_2O$	GTE	NA	NA	18.08-80.34	14	Baud	1909	France	French
$NH_3 + H_2O$	TS	20-100	NA	2-16	232	Uemura	1977	Japan	Japanese
$NH_3 + H_2O$	TE	23-156	0.48-37.23	0.0-100.0	95	Jennings	1965	U.S.A.	English
$NH_3 + H_2O$	P	40-316	0.07-210	0.0-100.0 0.0-100.0	64	Gillespie	1985	U.S.A.	English

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(2) - mbar

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M - Mole, W - Weight
NA - Not Available

Table A.1.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$NH_3 + H_2O$: LiBr (2:3)(W)	TGS	30-180	NA	0-100	177	Radermacher	1981	Germany	English
$NH_3 + H_2O$: LiBr(2:3)(W)	TS	30-180	NA	0-100	178	Radermacher	1982	Germany	German
$NH_3 + H_2O$: $LiNO_3$ (3:1)(W)	TEP	20-90	0-25	16-100	47	Ehmke	1984	Germany	German
$NH_3 + H_2O$: $LiNO_3$ (3:1)(W)	GS	20-200	0-25	16-100	47	Ehmke	1984	Germany	German
NH_3 + NaSCN	GE	-65-100	NA	31.2-89.9	23	Blytas	1962	U.S.A.	English
NH_3 + LiSCN	TE	27-138	NA	37.4-52.5	128	Macriss	1971	U.S.A.	English
A.1.6. Vapor-Liquid Enthalpies									
$NH_3 + H_2O$	TE	-26.25 - 131.83	9.2-17.9	10-90	278	Zinner	1934	Germany	German
$NH_3 + H_2O$	GS	-100-200	NA	0-100	278	Zinner	1934	Germany	German
$NH_3 + H_2O$	GS	-80-180	NA	0-100	278	Zinner	1934	Germany	German

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(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.1.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$NH_3 + H_2O$	TS	-70-180	NA	0-100	278	Zinner	1934	Germany	German
$NH_3 + H_2O$	TE	-50-211.4	0.2-20	0-100 0-100	140	Merkel	1929	Germany	German
$NH_3 + H_2O$	CP	-40-220	0.2-50	0-100	276	Ziegler	1982	Switzerland	German
$NH_3 + H_2O$	GCP	-40-220	0.2-50	0-100	276	Ziegler	1982	Switzerland	German
$NH_3 + H_2O$	CP	-40-220	0.2-50	0-100	277	Ziegler	1984	Switzerland	English
$NH_3 + H_2O$	GCP	-40-220	0.2-50	0-100	277	Ziegler	1984	Switzerland	English
$NH_3 + H_2O$	CP	-70-175	0.01-25	NA	198	Schulz	1972	Germany	German
$NH_3 + H_2O$	P	NA	NA	NA	50	Electrolux	1970	Sweden	English
$NH_3 + H_2O$	GTP	-50-230	NA	0-100	50	Electrolux	1970	Sweden	English
$NH_3 + H_2O$	GC	NA	0.7-34.47	0-100	146	Morel	1983	France	French
$NH_3 + H_2O$	TE	41-227	2.83-35.58	5.0-38.0	123	Macriss	1964	U.S.A.	English
$NH_3 + H_2O$	GS	-60-140	NA	0-100	170	Plank	1953	Germany	German

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NA - Not Available

Table A.1.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$NH_3 + H_2O$	GC	150-250	4-35	0-100	51	Ellerwald	1981	Germany	German
$NH_3 + H_2O$	PTS	-34-211	0.5-19.6	0-100	269	Zatorskii	1978	U.S.S.R.	Russian
$NH_3 + H_2O$	CP	-5-7, 43-55	3.45-5.52, 17.24-24.13	NA	94	Jain	1971	U.S.A.	English
$NH_3 + H_2O$	P	-62-499	0.07-109	0.0-100.0 0.0-100.0	53	El-Sayed	1985	U.S.A.	English
$NH_3 + H_2O$: LiBr (2:3)(W)	GS	-20-210	1-30	0-100	177	Radermacher	1981	Germany	English
$NH_3 + H_2O$: LiBr (2:3)(W)	GS	-70-210	1-30	0-100	178	Radermacher	1982	Germany	German
A.1.7. Specific Heat									
$NH_3 + H_2O$	P	NA	NA	NA	232	Uemura	1977	Japan	Japanese
$NH_3 + H_2O$	P	-40-220	0.2-50	0-100	276	Ziegler	1982	Switzerland	German
$NH_3 + H_2O$	P	-40-220	0.2-50	0-100	277	Ziegler	1984	Switzerland	English
$NH_3 + H_2O$	GS	10-30	NA	0-100	232	Uemura	1977	Japan	Japanese

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NA - Not Available

Table A.1.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$NH_3 + H_2O$: LiBr (2:3)(W)	TGS GE	30-150	NA	0-100	177	Radermacher	1981	Germany	English
$NH_3 + H_2O$: LiBr (2:3)(W)	GS	30-200	NA	0-100	176	Radermacher	1981	Germany	English
$NH_3 + H_2O$: LiBr (2:3)(W)	TS	30-200	NA	0-100	178	Radermacher	1982	Germany	German
$NH_3 + LiNO_3$: H_2O (3:1)(W)	TEP	20-60	NA	0-50	47	Ehmke	1984	Germany	German
$NH_3 + LiNO_3$: H_2O (3:1)(W)	GS	20-90	NA	0-50	47	Ehmke	1984	Germany	German
$NH_3 + LiNO_3$: H_2O (3:1)(W)	GS	20-90	NA	10-50	32	Bokelmann	1985	Germany	English
NH_3 + NaSCN	TE	0-25	NA	12.3-42.6	23	Blytas	1962	U.S.A.	English
$NH_3 + LiNO_3$	GSP	NA	NA	24-40	62	Gensch	1937	Germany	German
A.1.8. Stability									
NH_3 + NaSCN	Nar.	150	NA	NA	90	Macriss	1964	U.S.A.	English

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NA - Not Available

Table A.1.0. (Cont.)

A.1.9. Viscosity

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$NH_3 + H_2O$	GTS	10-149	1-20	0-100	124	Pinevich	1948	U.S.S.R.	English
NH_3 + NaSCN	GE	-10-60	NA	35.0-100.0	23	Blytas	1962	U.S.A.	English
NH_3 + LiSCN	TE	24-93	NA	39.0-52.0	128	Macriss	1971	U.S.A.	English
$NH_3 + LiNO_3$: H_2O (2.3:1 to ∞)	GE	10-70	NA	26.2-32.2	46	Ehmke	1983	Germany	English

A.1.10. Mass Transfer Rate

$NH_3 + H_2O$	GE	26	0.40-1.07	NA	36	Burnett	1970	U.S.A.	English
$NH_3 + H_2O$	C	NA	NA	NA	163	Osipov	1972	U.S.S.R.	English
$NH_3 + H_2O$	GS	NA	0-4	0-40	163	Osipov	1972	U.S.S.R.	English
$NH_3 + H_2O$	GE	NA	10-20	NA	163	Osipov	1972	U.S.S.R.	English
NH_3 + NaSCN	GE	25	1	40-50	104	Kashiwaga	1987	Japan	Japanese

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(2) - mbar
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M - Mole, W - Weight
NA - Not Available

Table A.1.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
A.1.11. Heat Transfer Rate									
$NH_3 + H_2O$	GS	30-36	NA	NA	163	Osipov	1972	U.S.S.R.	English
$NH_3 + H_2O$	GE	NA	10-20	NA	163	Osipov	1972	U.S.S.R.	English
$NH_3 + H_2O$	C	NA	NA	NA	163	Osipov	1972	U.S.S.R.	English
A.1.12. Thermal Conductivity									
$NH_3 + H_2O$	GS	0-60	NA	0-100	232	Uemura	1977	Japan	Japanese
NH_3 + NaSCN	TE	20-69	NA	12.3-17.3	23	Blytas	1962	U.S.A.	English
A.1.13. Refractive Index									
$NH_3 + H_2O$	GS	NA	5-20	0-100	278	Zinner	1934	Germany	German
A.1.14. Entropy									
$NH_3 + H_2O$	CP	-40-220	0.2-50	0-100	276	Ziegler	1982	Switzerland	German
$NH_3 + H_2O$	CP	-40-220	0.2-50	0-100	277	Ziegler	1984	Switzerland	English
$NH_3 + H_2O$	CP	NA	NA	NA	59	Fischer	1935	Germany	German

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(2) - mbar
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NA - Not Available

Table A.1.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$NH_3 + H_2O$	P	-62-499	0.07-109	0.0-100.0 0.0-100.0	53	El-Sayed	1985	U.S.A.	English
$NH_3 + H_2O$	GS	-50-200	0.6-25	0-100	111	Kouremenos	1971	Greece	German
$NH_3 + H_2O$	PTS	-34-211	0.5-19.6	0-100	269	Zatorskii	1978	U.S.S.R.	English

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Table A.2.0. WATER BINARY AND MULTICOMPONENT ABSORPTION FLUIDS PROPERTIES DATA

A.2.1. Vapor-Liquid Equilibrium

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr	TEP	0-72	0.42-53 (1)	42.2-55.6	133	Matsuda	1980	Japan	Japanese
H_2O + LiBr	GEP	0-72	0.6-60 (1)	44.8-54.6	133	Matsuda	1980	Japan	Japanese
H_2O + LiBr	GP	0-80	0.4-100 (1)	35.0-60.0	133	Matsuda	1980	Japan	Japanese
H_2O + LiBr	GEP	20-160	2-800 (1)	35.5-77.2	248	Uemura	1964	Japan	English
H_2O + LiBr	GP	30-160	1-800 (1)	40.0-65.0	248	Uemura	1964	Japan	English
H_2O + LiBr	P	NA	NA	NA	232	Uemura	1977	Japan	Japanese
H_2O + LiBr	GEP	0-150	3-800 (1)	35.5-100.0	70	Hasaba	1959	Japan	Japanese
H_2O + LiBr	TGP	0-180	1-800 (1)	40.0-80.0	70	Hasaba	1959	Japan	Japanese
H_2O + LiBr	GE	30-100	3.16-160 (1)	NA	92	Iyoki	1977	Japan	Japanese
H_2O + LiBr	GS	-20-190	0.1-1000 (1)	30.0-100.0	161	Oouchi	1985	Japan	Japanese
H_2O + LiBr	TEP	20-175	5-950 (2)	30.0-75.0	183	Renz	1981	Germany	German
H_2O + LiBr	GS	0-180	1-1000 (2)	30.0-100.0	183	Renz	1981	Germany	German

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(1) - mmHg

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(2) - mbar

c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr	TE	25-93	0.002-0.26	40 & 50	58	Felli	1979	Italy	English
H_2O + LiBr	GE	0-110	0.01-0.32	40-100	58	Felli	1979	Italy	English
H_2O + LiBr	GC	0-180	0.01-1	0-70	186	Renz	1982	Germany	English
H_2O + LiBr	GS	0-180	1-1000 (2)	30.0-100.0	218	Steimle	1981	Germany	English
H_2O + LiBr	GS	0-180	1-1000 (2)	30.0-100.0	219	Steimle	1981	Germany	English
H_2O + LiBr	GP	20-240	1-10,000 (1)	38.0-45.0	162	Osaka Gas	1985	Japan	Japanese
H_2O + LiBr	P GTP	0-200	1.4-7000 (1)	30.0-100.0	261	Usyukin	1969	U.S.S.R.	English
H_2O + LiBr	TE	0-100	0.0008-1.01	27.8-100.0	52	Ellington	1957	U.S.A.	English
H_2O + LiBr	TE	25-177	0.0010-3.61	39.6-50.3	165	Pennington	1955	U.S.A.	English
H_2O + LiBr	TEGP	4-182	0.001-0.85	37.7-100.0	137	McNeely	1979	U.S.A.	English
H_2O + LiBr	GE	28-56	0.0037-0.030	41.0-46.9	119	Ledding	1965	U.S.A.	English
H_2O + LiBr	GS	100	0.1-1	40-100	46	Ehmke	1983	Germany	English

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr	GS	0-180	0.001-1	0-70	121	Lower	1961	Germany	English
H_2O + LiBr	GS	0-120	0.003-0.92	30-100	192	Rosenfeld	1958	U.S.S.R.	Russian
H_2O + LiBr	TSGP	0-250	0.1-15.5	30.0-100.0	80	Herold	1967	U.S.A.	English
H_2O + LiBr	TE	64-127	0.02-0.31	35.8-40.1	136	Maust	1966	U.S.A.	English
H_2O + LiCl	GTEP	30.09-120.46	10.2-702.6 (1)	52.9-89.1	259	Uemura	1965	Japan	Japanese
H_2O + LiCl	TS	0-120	1.5-1430 (1)	50.0-95.0	259	Uemura	1965	Japan	Japanese
H_2O + LiCl	GP	0-120	1-2000 (1)	50.0-100.0	259	Uemura	1965	Japan	Japanese
H_2O + LiCl	GS	0-120	1-2000 (1)	50.0-100.0	259	Uemura	1965	Japan	Japanese
H_2O + LiCl	GEP	0-150	2-2000 (1)	52.9-89.1	239	Uemura	1967	Japan	English
H_2O + LiCl	TS	0-120	1.5-1430 (1)	50.0-95.0	239	Uemura	1967	Japan	English
H_2O + LiCl	GP	0-120	1-2000 (1)	50.0-90.0	239	Uemura	1967	Japan	English
H_2O + LiCl	P	NA	NA	NA	232	Uemura	1977	Japan	Japanese

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiCl	TGE	103.9-160.6	1	46.3-87.5	77	Hasaba	1964	Japan	Japanese
H_2O + LiI	GE	-10-110	1-1000 (1)	19.6-100.0	246	Uemura	1969	Japan	Japanese
H_2O + LiI	GP	0-100	1-100 (1)	20.0-100.0	246	Uemura	1969	Japan	Japanese
H_2O + LiI	TE	26.30-35.35	22.54-23.65 (1)	51.6-79.0	246	Uemura	1969	Japan	Japanese
H_2O + LiI	GS	20-120	0.006-2.0	15.0-50.0	19	Biermann	1978	U.S.A.	English
H_2O + LiI	GE	0-110	0.01-0.32	44-100	58	Felli	1979	Italy	English
H_2O + LiI	TE	10-77	0.01-0.35	68	58	Felli	1979	Italy	English
H_2O + $LiNO_3$	GS	100	0.06-1	60-100	46	Ehmke	1983	Germany	English
H_2O + H_2SO_4	CP	NA	NA	NA	78	Hasseler	1982	England	English
H_2O + $ZnBr_2$	GE	0-110	0.01-0.32	30-100	58	Felli	1979	Italy	English
H_2O + NaBr	GE	0-110	0.01-0.32	50-100	58	Felli	1979	Italy	English
H_2O + NaI	GE	0-110	0.01-0.32	35-100	58	Felli	1979	Italy	English
H_2O + NaOH	GS	75-175	0.02-1.0	30.0	55	Erickson	1985	U.S.A.	English

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + KOH	GS	75-130	0.02-1.0	30.0	55	Erickson	1985	U.S.A.	English
H_2O + $ZnCl_2$	GE	26-59	0.0024-0.012	19.7	119	Ledding	1965	U.S.A.	English
H_2O + CsF	GE	25-65	0.0019-0.017	12.2-20.9	119	Ledding	1965	U.S.A.	English
H_2O + KF	GE	25-43	0.010-0.030	69.4	119	Ledding	1965	U.S.A.	English
H_2O + $ZnNO_3$	TE	38-110	0.0013-1.33	1.6-27.3	56	Ewing	1937	U.S.A.	English
H_2O + $LiClO_3$	GTE	27-82	0.0025-0.035	19.6-37.4	19	Biermann	1978	U.S.A.	English
H_2O + $LiNO_2$	GTE	27-54	0.0083-0.037	Sat. at 20°C	19	Biermann	1978	U.S.A.	English
H_2O + LiSCN	GTE	27-49	0.010-0.033	Sat. at 20°C	19	Biermann	1978	U.S.A.	English
H_2O + $LiBF_4$	GTE	27-32	0.019-0.023	Sat. at 20°C	19	Biermann	1978	U.S.A.	English
H_2O + LiH_2-Phosphite	GTE	27-32	0.022-0.032	Sat. at 20°C	19	Biermann	1978	U.S.A.	English
H_2O + DMETEG	GE	60-115	200 (2)	0-100	200	Seher	1985	Germany	German
H_2O + DEG	C	NA	NA	0-100	106	Klyucheva	1980	U.S.S.R.	English

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + DEG	GS	120	0-2	0-100	106	Klyucheva	1980	U.S.S.R.	English
H_2O + TEG	GE	60-160	200 & 918 (2)	0-100	200	Seher	1985	Germany	German
H_2O + DMF	TEP	30-150	17-760 (1)	0-100	152	Myasnikova	1974	U.S.S.R.	English
H_2O + DMF	GEP	-10-40	NA	0-48	54	Ennan	1972	U.S.S.R.	English
H_2O + PPA	TEP	60-100	0.05-1.02	0.2-99.6 (M) 0.2-95.8 (M)	179	Rafflenbeul	1978	Germany	German
H_2O + PPA	GS	60-100	0.05-1.02	0.2-99.6 (M) 0.2-95.8 (M)	179	Rafflenbeul	1978	Germany	German
H_2O + Cs-Acetate	GE	27-51	0.0028-0.010	13.8	119	Ledding	1965	U.S.A.	English
H_2O + $LiCF_3CO_2$	GTE	27-43	0.011-0.028	Sat. at 20°C	19	Biermann	1978	U.S.A.	English
H_2O + $LiCCl_3CO_2$	GTE	27-41	0.015-0.033	Sat. at 20°C	19	Biermann	1978	U.S.A.	English
H_2O + Li-Benzenesulfonate	GTE	27-35	0.021-0.032	Sat. at 20°C	19	Biermann	1978	U.S.A.	English

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + Utropin	GEP	-10-40	NA	0-48	54	Ennan	1972	U.S.S.R.	English
H_2O + LiBr: LiSCN (1:1)(M)	GTEP	28-89	17.63-242.66 (1)	42.6-94.8	84	Iyoki	1981	Japan	Japanese
H_2O + LiBr: LiSCN (1:1)(M)	GS	15-100	2-400 (1)	40.0-60.0	84	Iyoki	1981	Japan	Japanese
H_2O + LiBr: LiSCN (1:1)(M)	GSP	0-130	0.05-1.0	42.6-94.8	235	Uemura	1980	Japan	Japanese
H_2O + LiBr: LiSCN (1:4)(M)	GE	0-130	1-1000 (2)	25.0-100.0	107	Knoche	1984	Germany	German
H_2O + LiBr: LiSCN (0.25:1-4:1)(M)	GS	21-93	0.0014-0.080	Sat. at 22°-35°C	127	Macriss	1970	U.S.A.	English
H_2O + LiBr: LiSCN (0.25:1-10:1)(M)	GE	60	0.016-0.024	Sat. at 20°C	19	Biermann	1978	U.S.A.	English
H_2O + LiBr: LiCL (0.1:1 to ∞)(W)	GSP	15-85	0.0014-1.33	37.4-66.8	262	Weil	1960	U.S.A.	English

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr: LiCl (4:1) (W)	TE	57-131	0.01-0.32	37.5-41.6	136	Maust	1966	U.S.A.	English
H_2O + LiBr: LiCl (0.98:1 to 17.7:1)(W)	GTE	20 & 60	3.95-100.42 (1)	57.1-72.3	252	Uemura	1969	Japan	Japanese
H_2O + LiBr: LiCl (2:1)(M)	TEP	20 & 60	8.02-138.1 (1)	60.0-90.0	247	Uemura	1970	Japan	Japanese
H_2O + LiBr: LiCl (2:1)(M)	GP	0-100	0-1000 (1)	20.0-100.0	247	Uemura	1970	Japan	Japanese
H_2O + LiBr: $LiClO_3$ (0.8:1)(M)	TE	58-82	0.0076-0.030	19.3-24.3	19	Biermann	1978	U.S.A.	English
H_2O + $LiNO_2$: $LiClO_3$ (0:1 to 9:1)(M)	TE	60	0.070-0.172	Sat. at 20°C	19	Biermann	1978	U.S.A.	English
H_2O + LiSCN: LiCl (0:1 to 9:1)(M)	TE	60	0.126-0.144	Sat. at 20°C	19	Biermann	1978	U.S.A.	English

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiCl: CsCl (2.46:1)	GE	29-55	0.033-0.135	31.0	119	Ledding	1965	U.S.A.	English
H_2O + LiCl: CsCl (2.83:1)	GE	31-57	0.028-0.125	28.2	119	Ledding	1965	U.S.A.	English
H_2O + LiBr: CsBr (5.4:1)	GE	26-56	0.012-0.069	28.5	119	Ledding	1965	U.S.A.	English
H_2O + LiBr: CsBr (6.94:1)	GE	29-59	0.016-0.093	32.9	119	Ledding	1965	U.S.A.	English
H_2O + RbF:CsF (1:1)	GE	27-66	0.0074-0.142	15.0-22.0	119	Ledding	1965	U.S.A.	English
H_2O + LiBr: $ZnBr_2$ (1:2.6)(W)	GEP	20-80	0.1-1.0	25.3-89.6	236	Uemura	1983	Japan	Japanese
H_2O + LiBr: $ZnBr_2$ (1:1)(W)	GS	-20-160	0.5-700 (1)	10.0-100.0	157	Ono	1979	Japan	English
H_2O + LiBr: $ZnBr_2$ (0.5:1-11:1)(M)	GS	27-127	0.0016-0.096	12.7-30.5	11	Aronson	1969	U.S.A.	English

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr: $ZnCl_2$ (1:1)	GP	20-240	1-10,000 (1)	20.0-30.0	162	Osaka Gas	1985	Japan	Japanese
H_2O + LiBr: $ZnCl_2$ (1:1)(W)	GE	0-250	0-2.0	20.0-30.0	131	Manago	1984	Japan	English
H_2O + LiBr: $ZnCl_2$ (1:1)(W)	GE	0-250	0-2.0	20.0-30.0	156	Ohuchi	1985	Japan	English
H_2O + LiCl: $ZnCl_2$ (1:1)(M)	GS	38-132	0.0033-0.096	12.2-28.3	11	Aronson	1969	U.S.A.	English
H_2O + NaOH:KOH (1:1)(W)	GS	70-200	0.02-1.0	30.0	55	Erickson	1985	U.S.A.	English
H_2O + LiBr:EG (10:1)(M)	GTEP	40.56-103.77	24.4-168.44 (1)	44.1-95.5	93	Iyoki	1981	Japan	Japanese
H_2O + LiBr:EG (10:1)(M)	GTE	37.8-132.6	30-600 (1)	41.0-100.0	93	Iyoki	1981	Japan	Japanese
H_2O + LiBr:EG (3.72:1-5:1)(W)	GS	30-130	0.0062-0.031	20.0-40.0	20	Biermann	1978	U.S.A.	English

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr:EG (4.4:1)(W)	GS	-20-160	0.5-700 (1)	10.0-100.0	157	Ono	1979	Japan	English
H_2O + LiBr:EG (0.93:1 to 4.4:1)(W)	TE	87-132	0.08-0.31	43.1-57.3	136	Maust	1966	U.S.A.	English
H_2O + LiBr:MEA (2.65:1-3.72:1) (W)	GS	30-130	0.0062-0.031	15.0-30.0	20	Biermann	1978	U.S.A.	English
H_2O + LiCl: LiAcetate (4:1-10:1)(M)	TE	60	0.012-0.140	Sat. at 20°C	19	Biermann	1978	U.S.A.	English
H_2O + LiBr: 4,BLN (20:1)(M)	GEP	60-120	0-700 (1)	44.1-100.0	234	Uemura	1981	Japan	Japanese
H_2O + LiBr: 4,BLN (20:1)(M)	GEP	60-120	100-700 (1)	44.1-100.0	87	Iyoki	1983	Japan	Japanese
H_2O + LiBr: 4,BLN (20:1)(M)	GS	40-100	30-400 (1)	40.0 & 60.0	87	Iyoki	1983	Japan	Japanese

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr: 4,BLN (20:1)(M)	GEP	60-120	0-700 (1)	44.1-100.0	88	Iyoki	1984	Japan	English
H_2O + LiBr: 4,BLN (20:1)(M)	GS	40-100	30-400 (1)	40.0 & 60.0	88	Iyoki	1984	Japan	English
H_2O + LiI:EG	GS	-20-160	0.5-700 (1)	10.0-100.0	157	Ono	1979	Japan	English
H_2O + LiBr: $ZnBr_2$:$CaBr_2$ (1.2:1:0.3)(M)	GS	27-260	0.0013-1.33	5.0-25.0	11	Aronson	1969	U.S.A.	English
H_2O + NaOH: KOH:CsOH (1.67:1.5:1)(W)	GS	50-175	0.01-1.0	30.0	55	Erickson	1985	U.S.A.	English
H_2O + $LiNO_3$: $NaNO_3$:KNO_3 (3.05:1.47:1)(W)	GS	50-300	0.02-15	30.0-100.0	40	Davidson	1986	U.S.A.	English
H_2O + LiCl: $CaCl_2$:$Zn(NO_3)_2$ (4.2:2.7:1)(W)	GS	0-130	0.002-0.89	40-100	168	Pinchuk	1982	U.S.S.R.	Russian

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Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr: $ZnBr_2$:DEG	GS	0-180	1-1000 (1)	15.0-40.0	157	Ono	1979	Japan	English
H_2O + LiBr: $ZnBr_2$:EG	GS	0-180	1-1000 (1)	15.0-40.0	157	Ono	1979	Japan	English
H_2O + LiBr: $ZnBr_2$:DMEDEG	GS	0-180	1-1000 (1)	15.0-40.0	157	Ono	1979	Japan	English
H_2O + LiBr: $ZnBr_2$:PD	GS	0-180	1-1000 (1)	15.0-40.0	157	Ono	1979	Japan	English
H_2O + LiI: LiBr:EG	GS	-20-160	0.5-700 (1)	0.0-100.0	157	Ono	1979	Japan	English
A.2.2. Crystallization Temperature									
H_2O + LiBr	TE	-16.7-78	NA	31.8-42.7	73	Hasaba	1960	Japan	Japanese
H_2O + LiBr	GE	-16.7-140	NA	24.0-42.7	73	Hasaba	1960	Japan	Japanese
H_2O + LiBr	GE	0-140	NA	19.2-50.0	248	Uemura	1964	Japan	Japanese
H_2O + LiBr	GE	-16.7-140	NA	19.2-50.0	232	Uemura	1977	Japan	Japanese

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr	GS	-68-140	NA	24.0-100.0	121	Lower	1961	Germany	German
H_2O + LiBr	GS	-10-80	NA	30.0-46.0	131	Manago	1984	Japan	English
H_2O + LiBr	GS	-10-80	NA	30.0-46.0	156	Ohuchi	1985	Japan	English
H_2O + LiBr	GE	-73-93	NA	0.0-100.0	52	Ellington	1957	U.S.A.	English
H_2O + LiBr	TE	-50-100	NA	8.2-20.2	33	Boryta	1961	U.S.A.	English
H_2O + LiBr	GE	15-75	NA	9.2-12.1	119	Ledding	1965	U.S.A.	English
H_2O + LiBr	GS	4-143	NA	NA	11	Aronson	1969	U.S.A.	English
H_2O + LiBr	TE	-72-159	NA	9.5-32.5	105	Kessis	1965	France	French
H_2O + LiBr	GE	-72-159	NA	0-100	105	Kessis	1965	France	French
H_2O + LiBr	TE	-67.2-138	NA	25.0-60.9	105	Kessis	1965	France	French
H_2O + LiBr	GS	0-50	NA	35-100	181	Renz	1978	Germany	German
H_2O + LiCl	TGE	-20-160	NA	41.4-74.0	74	Hasaba	1964	Japan	Japanese
H_2O + LiCl	GE	-20-160	NA	40.0-65.0	239	Uemura	1967	Japan	English

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiI	TGE	-10-80	NA	18.9-40.1	246	Uemura	1969	Japan	Japanese
H_2O + $ZnBr_2$	GS	21	NA	NA	11	Aronson	1969	U.S.A.	English
H_2O + LiSCN	GS	22	NA	19.0	6	AGA	1968	U.S.A.	English
H_2O + $LiNO_3$	GE	0-60	NA	30-65	225	Tsimbalist	1983	U.S.S.R.	English
H_2O + NaOH	GS	40-125	NA	NA	55	Erickson	1985	U.S.A.	English
H_2O + KOH	GS	20-125	NA	NA	55	Erickson	1985	U.S.A.	English
H_2O + CsF	GE	6-56	NA	2.3-2.5	119	Ledding	1965	U.S.A.	English
H_2O + CsBr	GE	10-57	NA	39.5-51.1	119	Ledding	1965	U.S.A.	English
H_2O + NaOH:KOH (1:1)(W)	GS	30-110	NA	NA	55	Erickson	1985	U.S.A.	English
H_2O + LiBr: CsBr (1:1 to 7:1)	GE	15-65	NA	20.9-56.0	119	Ledding	1965	U.S.A.	English
H_2O + CsF:RbF (1:1)	GE	-2.2-22	NA	2.5-4.2	119	Ledding	1965	U.S.A.	English

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr: LiSCN (0.25:1 to 4:1)(M)	GE	-6-93	NA	25.0-47.0	127	Macriss	1970	U.S.A.	English
H_2O + LiBr: LiSCN (4:1 to 1:4)(M)	GS	22-30	NA	9.7-16.2	6	AGA	1968	U.S.A.	English
H_2O + LiBr: LiSCN (1:1)(M)	GTE	0.3-73.3	NA	31.4-46.4	84	Iyoki	1981	Japan	Japanese
H_2O + LiBr: LiSCN (1:1) (M)	GS	0-100	NA	30.0-44.0	235	Uemura	1980	Japan	Japanese
H_2O + LiBr: LiSCN (0:1 to B)(M)	GE	-10-90	NA	50.0-80.0	107	Knoche	1984	Germany	German
H_2O + LiBr: $ZnBr_2$ (0.9:1 to 1.2:1)(M)	GS	24-99	NA	NA	11	Aronson	1969	U.S.A.	English
H_2O + LiBr: $ZnBr_2$ (1:1)(M)	GS	10-143	NA	NA	11	Aronson	1969	U.S.A.	English

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr: $ZnBr_2$ (1:1)	GE	5-42	NA	NA	157	Ono	1979	Japan	English
H_2O + LiBr: $ZnBr_2$ (1:1)	GS	-20-160	0.5-700 (1)	10.0-100.0	157	Ono	1979	Japan	English
H_2O + LiBr: $ZnBr_2$ (1.0:2.6) (W)	GE	0-150	NA	10.0-25.0	236	Uemura	1983	Japan	Japanese
H_2O + LiBr: $ZnBr_2$ (0.39:1) (W)	GE	0-65	NA	15.0-20.0	131	Manago	1984	Japan	English
H_2O + LiBr: $ZnBr_2$ (0.39:1) (W)	GE	0-65	NA	15.0-20.0	156	Ohuchi	1985	Japan	English
H_2O + LiBr: $ZnBr_2$ (0.64:1) (W)	GE	10-50	NA	15.0-25.0	156	Ohuchi	1985	Japan	English
H_2O + LiCl: $ZnBr_2$ (0.19:1) (W)	GE	-10-65	NA	15.0-25.0	131	Manago	1984	Japan	English

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NA - Not Available

Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiCl: $ZnBr_2$ (0.19:1) (W)	GE	-10-65	NA	15.0-25.0	156	Ohuchi	1985	Japan	English
H_2O + LiCl: $ZnBr_2$ (1:1)(M)	GS	10-63	NA	NA	11	Aronson	1969	U.S.A.	English
H_2O + LiBr: $ZnCl_2$ (1:1)(W)	GE	-20-65	NA	15.0-30.0	131	Manago	1984	Japan	English
H_2O + LiBr: $ZnCl_2$ (0.64:1) (W)	GE	10-50	NA	15.0-25.0	131	Manago	1984	Japan	English
H_2O + LiBr: $ZnCl_2$ (1:1)(W)	GE	-20-65	NA	15.0-30.0	156	Ohuchi	1985	Japan	English
H_2O + LiCl: $ZnCl_2$ (1:1)(M)	GS	29	NA	NA	11	Aronson	1969	U.S.A.	English
H_2O + $CaBr_2$: $ZnBr_2$ (0.3:1)(M)	GS	18-79	NA	NA	11	Aronson	1969	U.S.A.	English
H_2O + LiBr:EG (10:1)(M)	GTE	21.50-74.9	NA	36.2-43.0	93	Iyoki	1981	Japan	Japanese

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr:EG	GS	-20-160	0.5-700 (1)	10.0-100.0	157	Ono	1979	Japan	English
H_2O + LiI:EG	GS	-20-160	0.5-700 (1)	10.0-100.0	157	Ono	1979	Japan	English
H_2O + LiBr: 4,BLN (20:1)(M)	GE	-20-140	NA	25.0-48.0	234	Uemura	1981	Japan	Japanese
H_2O + LiBr: 4,BLN (20:1)(M)	GTE	-18.01-150.04	NA	24.2-47.5	87	Iyoki	1983	Japan	Japanese
H_2O + LiBr: 4,BLN (20:1)(M)	GTE	-18.01-150.04	NA	24.2-47.5	88	Iyoki	1984	Japan	English
H_2O + NaOH: KOH:CsOH (1.67: 1.5:1)(W)	GS	5-140	NA	NA	55	Erickson	1985	U.S.A.	English
H_2O + LiBr: CsBr:RbBr (2:1:0.7)	GE	22-29	NA	5.6-10.0	119	Ledding	1965	U.S.A.	English
H_2O + LiCl: $CaCl_2$:$Zn(NO_3)_2$ (4.2:2.7:1)(W)	GS	5-70	NA	30-55	168	Pinchuk	1982	U.S.S.R.	Russian

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr: $ZnBr_2$:$CaBr_2$ (1:1:1)(M)	GS	43-100	NA	NA	11	Aronson	1969	U.S.A.	English
(1.2:1:0.5)(M)	GS	4-27	NA	NA	11	Aronson	1969	U.S.A.	English
(1.2:1:0.12)(M)	GS	16	NA	NA	11	Aronson	1969	U.S.A.	English
(1.2:1:0.3)(M)	GS	4-60	NA	NA	11	Aronson	1969	U.S.A.	English
(1.1:1:0.27)(M)	GS	43	NA	NA	11	Aronson	1969	U.S.A.	English
H_2O + $ZnBr_2$: LiBr (1:1):EG	GE	0-42	NA	NA	157	Ono	1979	Japan	English
H_2O + $ZnBr_2$: LiBr (1:1):PD	GE	25-42	NA	NA	157	Ono	1979	Japan	English
H_2O + $ZnBr_2$: LiBr (1:1): MBEDEG	GE	32-42	NA	NA	157	Ono	1979	Japan	English
H_2O + $ZnBr_2$: LiBr (1:1):DEG	GE	18-42	NA	NA	157	Ono	1979	Japan	English
H_2O + LiI: LiBr:EG	GS	-20-160	0.5-700 (1)	0.0-100.0	157	Ono	1979	Japan	English

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Table A.2.0. (Cont.)

A.2.3. Corrosion

Fluid System	Data Type	Temp. Range, °C	Corrosion Inhibitor, wt %		Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr	TE	NA	LiSCN	0.2	37.0	232	Uemura	1977	Japan	Japanese
			$LiNO_3$	0.3						
			Li_2WO_4	0.2						
			Li_3PO_4	0.2						
			$Li_2SiF_6.2H_2O$	0.2						
			$Li_6(MO_7O_{24})$ $.12H_2O$	0.1						
			$Li_2SiO_3.nH_2O$	0.2						
			$LiClO_4.3H_2O$	0.2						
			NH_2CONH_2	0.3						
			$(C_6H_5NH)_2C:NH$	0.2						
			$C_6H_4SC(SH):N$	0.1						
			5 Methylbenzo triazole	0.2						
			n-octyl Alcohol	0.1						
			$C_6H_4(CN)_2$	0.2						
			Cobratec 99	0.1						
			Cobratec 100	0.1						
			$C_6H_4(CO_2)O$	0.1						
			NHCH:NCN:CH	0.2						

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Corrosion Inhibitor, wt %	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr	TE	NA	Above Inhibitors + LiOH 0.2	37.0	232	Uemura	1977	Japan	Japanese
H_2O + LiBr	TE	143-182	Various Lithium Salts + LiOH + Organics 0.1-0.3	37.0-46.0	42	Dockus	1963	U.S.A.	English
H_2O + LiBr	TE	NA	None	37.0	91	Iyoki	1978	Japan	Japanese
H_2O + LiBr	TE	NA	LiOH 0.2	37.0	91	Iyoki	1978	Japan	Japanese
H_2O + LiBr	GE	NA	LiOH 0.1-1 Cobrate 99 0.1-1 Cobrate 100 0.1-1	37.0	91	Iyoki	1978	Japan	Japanese
H_2O + LiBr	TE	NA	$LiNO_3$ 0.3 LiSCN 0.2 Li_2WO_4 0.2 Li_3PO_4 0.2 $Li_2SiF_6.2H_2O$ 0.2 $Li_6(MO_7O_{24})$ $.12H_2O$ 0.1 $Li_2SiO_3.nH_2O$ 0.2 $LiClO_4.3H_2O$ 0.2 NH_2CONH_2 0.3	37.0	91	Iyoki	1978	Japan	Japanese

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Corrosion Inhibitor, wt %		Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
			$(C_6H_5NH)_2C{:}NH$	0.2						
			$C_6H_4SC(SH){:}N$	0.1						
			5 Methylbenzo-triazole	0.2						
			$C_6H_4(CN)_2$	0.2						
			Cobratec 99	0.1						
			Cobratec 100	0.1						
			$C_6H_4(CO_2)O$	0.1						
			NHCH:NCH:CH	0.2						
			n-Octyl alcohol	0.1						
H_2O + LiBr	TE	NA	Above Inhibitors + LiOH	0.2	37.0	91	Iyoki	1978	Japan	Japanese
H_2O + LiBr	GE	NA	None		41.0-47.0	91	Iyoki	1978	Japan	Japanese
H_2O + LiBr	TE	NA	LiSCN	0.2	37.0	238	Uemura	1978	Japan	Japanese
			$LiNO_3$	0.3						
			Li_2WO_4	0.2						
			Li_3PO_4	0.2						
			$Li_2SiF_6.2H_2O$	0.2						
			$Li_6(MO_2O_{24}).12H_2O$	0.1						
			$Li_2SiO_3.nH_2O$	0.2						

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Corrosion Inhibitor, wt %	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
			$LiClO_4.3H_2O$ 0.2 NH_2CONH_2 0.3 $(C_6H_5NH)_2C:NH$ 0.2 $C_6H_5SC(SH):N$ 0.1 5 Methylbenzo-triazole 0.2 n-octylalcohol 0.1 $C_6H_4(CN)_2$ 0.2 Cobratec 99 0.1 Cobratec 100 0.1 $C_6H_4(CO_2)O$ 0.1 NHCH:NCN:CH 0.2						
H_2O + LiBr	TE	NA	Above Inhibitors + LiOH 0.2	37.0	238	Uemura	1978	Japan	Japanese
H_2O + LiBr	GE	NA	None	42.0-74.0	237	Uemura	1979	Japan	Japanese
H_2O + LiBr	GE	NA	LiOH 0.2-1	37.0	237	Uemura	1979	Japan	Japanese
H_2O + LiBr	GE	NA	LiSCN 0.2 $LiNO_3$ 0.3 $LiWO_4$ 0.2 Li_3PO_4 0.2 $Li_2SiF_6.2H_2O$ 0.2	37.0	237	Uemura	1979	Japan	Japanese

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Corrosion Inhibitor, wt %	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
			$Li_5(MO_7O_{24})$ $.12H_2O$ 0.1 $Li_2SiO_3.nH_2O$ 0.2 $LiClO_4.3H_2O$ 0.2 NH_2CONH_2 0.3 $(C_6H_5N_4)_2C:NH$ 0.2 $C_6H_4SC(SH):N$ 0.1 5 Methylbenzo-triazole 0.2 n-octyl alcohol 0.1 $C_6H_4(CN)_2$ 0.2 Cobratec 99 0.1 Cobratec 100 0.1 $C_6H_4(CO_2)$ 0.1 NHCH:NCN:CH 0.2						
H_2O + LiBr	GE	NA	Above Inhibitors + LiOH 0.2	37.0	237	Uemura	1979	Japan	Japanese
H_2O + LiBr	GE	NA	Cobratec 99 0-0.8 Cobratec 100 0-0.8	37.0	237	Uemura	1979	Japan	Japanese
H_2O + LiBr	TE	132	Li_2MoO_4, $LiO_2CC_6H_5$	45.0	263	Weil	1956	U.S.A.	English

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Corrosion Inhibitor, wt %	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr		NA	None	47.0	52	Ellington	1957	U.S.A.	English
H_2O + LiBr	TE	75	$LiCrO_4$ (0-2000 ppm)	46.0	39	Cohen	1966	U.S.A.	English
H_2O + LiBr	TE	50	12 Compounds	63.0	139	Melnik	1982	U.S.S.R.	Russian
H_2O + LiBr	E	160	Li_2CrO_4 0.1 LiOH 0.16	32.0	67	Griess	1985	U.S.A.	English
H_2O + LiCl	GE	NA	None	42.0-74.0	90	Iyoki	1980	Japan	Japanese
H_2O + LiCl	TE	NA	None	59.7	90	Iyoki	1980	Japan	Japanese
H_2O + LiCl	GTE	NA	LiOH 0.2	59.7	90	Iyoki	1980	Japan	Japanese
H_2O + LiCl	GE	NA	NHCH:NCH:CH 0.2 Cobratec 99 0.1 Cobratec 100 0.1 $C_6H_4(CO_2)O$ 0.1 $C_6H_4SC(SH):N$ 0.1 $(C_6H_5NH)_2C:NH$ 0.2 NH_2CONH_2 0.3 $Li_6(Mo_7O_{24})$ $.12H_2O$ 0.1	59.7	90	Iyoki	1980	Japan	Japanese

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Corrosion Inhibitor, wt %	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
			$LiClO_4.3H_2O$ 0.2 $LiNO_3$ 0.3 $LiSiO_3.nH_2O$ 0.2 $LiSiF_6.2H_2O$ 0.2 $Li_3PO_4.1/2H_2O$ 0.2 $LiWO_4.H_2O$ 0.2 $LiSCN.H_2O$ 0.2						
H_2O + LiCl	GE	NA	Above Inhibitors + LiOH 0.2	59.7	90	Iyoki	1980	Japan	Japanese
H_2O + LiCl	GE	NA	Cobratec 99 0-0.9 Cobratec 100 0-0.9	59.7	90	Iyoki	1980	Japan	Japanese
H_2O + LiCl	TE	NA	LiOH 0.2	59.7	230	Uemura	1979	Japan	Japanese
H_2O + NH_4SCN	TE	24-100	None	5.6-68.0	124	Macriss	1964	U.S.A.	English
H_2O + LiBr: LiSCN	TE	NA	None	52.0	89	Iyoki	1981	Japan	Japanese
H_2O + LiBr: LiSCN	TE	NA	LiOH 0.2	52.0	89	Iyoki	1981	Japan	Japanese
H_2O + LiBr: LiSCN	GE	NA	None	52.0	89	Iyoki	1981	Japan	Japanese

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Corrosion Inhibitor, wt %	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr: LiSCN	GE	NA	NH_2CONH_2 0.3 $(C_6H_5NH)_2C:NH$ 0.2 $C_6H_4SC(SH):N$ 0.1 $C_6H_3N_3HCH_3$ 0.2 $C_6H_4(CN)_2$ 0.2 Cobratec 99 0.1 Cobratec 100 0.1 $C_6H_4(CO)_2O$ 0.1 NHCH:NHH:CH 0.2 $CH_3(CH_2)_6CH_2OH$ 0.1 $LiNO_3$ 0.3 Li_2WO_4 0.2 $LiPO_4.1/2H_2O$ 0.2 $Li_2SiF_6.2H_2O$ 0.2 $Li_6(Mo_7O_{24})$ $.12H_2O$ 0.1 $Li_2SiO_3.nH_2O$ 0.2 $LiClO_4.3H_2O$ 0.2	52.0	89	Iyoki	1981	Japan	Japanese
H_2O + LiBr: LiSCN	GE	NA	Above Inhibitors + LiOH 0.2	52.0	89	Iyoki	1981	Japan	Japanese
H_2O + LiBr: LiSCN	GE	NA	Cobratec 99 0-0.8 Cobratec 100 0-0.8 $LiNO_3$ 0-0.6	52.0	89	Iyoki	1981	Japan	Japanese

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Corrosion Inhibitor, wt %		Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr: LiSCN	TE	NA	None		52.0	230	Uemura	1981	Japan	Japanese
H_2O + LiBr: LiSCN	TE	NA	LiOH	0.2	52.0	230	Uemura	1981	Japan	Japanese
H_2O + LiBr: LiSCN	GE	NA	None		40.0-56.0	230	Uemura	1981	Japan	Japanese
H_2O + LiBr: LiSCN	GE	NA	NH_2CONH_2	0.3	52.0	230	Uemura	1981	Japan	Japanese
			$(C_6H_5NH)_2C:NH$	0.2						
			$C_6H_4SC(SH):N$	0.1						
			$C_6H_3N_3HCH_3$	0.2						
			$C_6H_4(CN)_2$	0.2						
			Cobratec 99	0.1						
			Cobratec 100	0.1						
			$C_6H_4(CO)_2O$	0.1						
			NHCH:NHH:CH	0.2						
			$CH_3(CH_2)_6CH_2OH$	0.1						
			$LiNO_3$	0.3						
			Li_2WO_4	0.2						
			$LiPO_4.1/2H_2O$	0.2						
			$Li_2SiF_6.2H_2O$	0.2						
			$Li_6(MO_7O_{24}).12H_2O$	0.1						

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Corrosion Inhibitor, wt %	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
			$LiSiO_3.nH_2O$ 0.2 $LiClO_4.3H_2O$ 0.2						
H_2O + LiBr: LiSCN	GE	NA	Above Inhibitors + LiOH 0.2	52.0	230	Uemura	1981	Japan	Japanese
H_2O + LiBr: LiSCN	GE	NA	Cobratec 99 0-0.8 Cobratec 100 0-0.8 $LiNO_3$ 0-0.8	52.0	230	Uemura	1981	Japan	Japanese
H_2O + LiBr: $ZnCl_2$ (1:1)(W)	GE	150 & 250	Li_2MoO_4	25.0	131	Manago	1984	Japan	English
H_2O + LiBr: $ZnCl_2$ (1:1)(W)	TGE	200 & 250	None	25.0	156	Ohuchi	1985	Japan	English
H_2O + LiBr: $ZnCl_2$ (1:1)(W)	TE	50-175	None	20.0	131	Manago	1984	Japan	English
H_2O + LiBr: $ZnCl_2$ (1:1)(W)	TE	200 & 250	None	20.0	131	Manago	1984	Japan	English
H_2O + LiBr: $ZnCl_2$ (1:1)(W)	GE	150	None	25.0	131	Manago	1984	Japan	English

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c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Corrosion Inhibitor, wt %		Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiCl: $CaCl_2$	GE	150	None		50.0	83	Isshiki	1985	Japan	English
H_2O + LiBr: 4,BLN (20:1)(M)	GE	NA	None		40.0-63.0	85	Iyoki	1982	Japan	Japanese
H_2O + LiBr: 4,BLN (20:1)(M)	GE	NA	LiOH	2.2-3.0	50.3	85	Iyoki	1982	Japan	Japanese
H_2O + LiBr: 4,BLN (20:1)(M)	TE	NA	None		50.3	85	Iyoki	1982	Japan	Japanese
H_2O + LiBr: 4,BLN (20:1)(M)	TE	NA	LiOH	2.45	50.3	85	Iyoki	1982	Japan	Japanese
H_2O + LiBr: 4,BLN (20:1)(M)	GE	NA	NH_2CONH_2 $(C_6H_5NH)_2C:NH$ $C_6H_4SC(SH):N$ $C_6H_3N_3HCH_3$ $C_6H_4(CN)_2$ Cobratec 99 Cobratec 100 NHCH:NCH:CH $LiNO_3$ Li_2WO_4		50.3	85	Iyoki	1982	Japan	Japanese

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg

R - Refrigerant
A - Absorbent(s)
(2) - mbar

c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Corrosion Inhibitor, wt %	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
			$Li_3PO_4.1/2H_2O$ $Li_2SiF_6.2H_2O$ $Li_6(Mo_7O_{24}).12H_2O$ $Li_2SiO_3.nH_2O$ $LiClO_3.3H_2O$						
H_2O + LiBr: 4,BLN (20:1)(M)	GE	NA	Cobratec 99 0.1-0.8	50.3	85	Iyoki	1982	Japan	Japanese
H_2O + LiBr: 4,BLN (20:1)(M)	GS	30 & 90	LiOH Cobratec 99 + LiOH Cobratec 100 + LiOH	50.3	85	Iyoki	1982	Japan	Japanese
H_2O + LiBr: Ethanol (3:1)(W)	TE	138	$LiNO_3$ (0-300 ppm)	20.0	20	Biermann	1978	U.S.A.	English
H_2O + LiBr:EG (3:1)(W)	TE	138	$LiNO_3$, Li_2MoO_4 (0-300 ppm)	20.0	20	Biermann	1978	U.S.A.	English
H_2O + LiBr: $ZnBr_2$:EG	GE	160	None	7.3-14.2	157	Ono	1979	Japan	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.2.0. (Cont.)

A.2.4. Heat of Mixing

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr	GTE	15-45	NA	46.1-99.7	76	Hasaba	1961	Japan	Japanese
H_2O + LiBr	GS	25	NA	40.0-100.0	76	Hasaba	1961	Japan	Japanese
H_2O + LiBr	GE	15-45	NA	40.0-100.0	248	Uemura	1964	Japan	English
H_2O + LiBr	GE	15-45	NA	40.0-100.0	232	Uemura	1977	Japan	Japanese
H_2O + LiBr	GP	-20-200	NA	30.0-100.0	261	Usyukin	1969	U.S.S.R.	English
H_2O + LiBr	GTC	25	NA	30.0-60.0	170	Plank	1953	Germany	German
H_2O + LiBr	GC	0-120	NA	30-100.0	121	Lower	1961	Germany	German
H_2O + LiBr	TC	25	NA	0.0-100.0	52	Ellington	1957	U.S.A.	English
H_2O + LiBr	TE	25	0.004-0.03	45.0-95.0	168	Pinchuk	1982	U.S.S.R.	Russian
H_2O + LiBr	TSP	25-135	NA	35.7-40.0	136	Maust	1966	U.S.A.	English
H_2O + LiCl	GTE	25	NA	56.4-69.2	253	Uemura	1965	Japan	Japanese
H_2O + LiCl	GS	25	NA	50.0-100.0	253	Uemura	1965	Japan	Japanese

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiCl	GS	25	NA	50.0-100.0	239	Uemura	1967	Japan	English
H_2O + LiI	GE	25	NA	40.0-100.0	246	Uemura	1969	Japan	Japanese
H_2O + H_2SO_4	GTC	NA	NA	0-100.0	170	Plank	1953	Germany	German
H_2O + DMF	TE	20	NA	0-100.0	195	Saphon	1973	Germany	German
H_2O + LiBr: LiSCN (1:1)(M)	GE	25	NA	40.0-100.0	84	Iyoki	1981	Japan	Japanese
H_2O + LiBr: LiSCN (1:1)(M)	GS	25	NA	30.0-100.0	235	Uemura	1980	Japan	Japanese
H_2O + LiBr: LiSCN (1:1)(M)	TS	25	NA	35.0-95.0	84	Iyoki	1981	Japan	Japanese
H_2O + LiBr: $ZnBr_2$ (1:2.6)(W)	GE	25	NA	0.0-100.0	236	Uemura	1983	Japan	Japanese
H_2O + LiBr: 4,BLN (20:1)(M)	GE	25	NA	41.9-100.0	234	Uemura	1981	Japan	Japanese
H_2O + LiBr: 4, BLN (20:1)(M)	TS	25	NA	42.0-96.0	87	Iyoki	1983	Japan	Japanese

X - Liquid Phase
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(1) - mmHg
R - Refrigerant
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(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr: 4,BLN (20:1)(M)	GE	25	NA	42.0-100.0	87	Iyoki	1983	Japan	Japanese
H_2O + LiBr: 4,BLN (20:1)(M)	TS	25	NA	42.0-96.0	88	Iyoki	1984	Japan	English
H_2O + LiBr: 4,BLN (20:1)(M)	GE	25	NA	41.9-100.0	88	Iyoki	1984	Japan	English
H_2O + LiBr:EG (4.5:1)(W)	TE	NA	NA	14.4-15.3	20	Biermann	1978	U.S.A.	English
H_2O + LiCl: $CaCl_2$:$Zn(NO_3)_2$ (4.2:2.7:1)(W)	GS	0-130	0.003-0.03	45.0-95.0	168	Pinchuk	1982	U.S.S.R.	Russian
H_2O + LiBr:EG: 4, BLN (10:1)(M)	GTE	25	NA	45.0-95.0	93	Iyoki	1981	Japan	Japanese
A.2.5. Liquid-Phase-Densities									
H_2O + LiBr	GTE	0-80	NA	40.9-89.5	77	Hasaba	1961	Japan	Japanese
H_2O + LiBr	GTS	0-100	NA	40.0-90.0	77	Hasaba	1961	Japan	Japanese

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(1) - mmHg

R - Refrigerant
A - Absorbent(s)
(2) - mbar

c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr	GTS	0-100	NA	40.0-90.0	248	Uemura	1964	Japan	English
H_2O + LiBr	TS	0-100	NA	40.0-90.0	232	Uemura	1977	Japan	Japanese
H_2O + LiBr	GS	0-100	NA	30.0-100.0	121	Lower	1961	Germany	German
H_2O + LiBr	GP	20-240	NA	38.0-45.0	162	Osaka Gas	1985	Japan	Japanese
H_2O + LiBr	GE	25-80	NA	35.0-100.0	52	Ellington	1957	U.S.A.	English
H_2O + LiBr	P	0-250	0.1-15.5	30.0-100.0	80	Herold	1987	U.S.A.	English
H_2O + LiBr	TSP	25-135	NA	35.0-51.0	136	Maust	1966	U.S.A.	English
H_2O + LiCl	GTE	5-90	NA	54.0-92.5	77	Hasaba	1964	Japan	Japanese
H_2O + LiCl	GTS	5-100	NA	60.0-95.0	77	Hasaba	1964	Japan	Japanese
H_2O + LiCl	GE	5-100	NA	50.0-100.0	239	Uemura	1967	Japan	English
H_2O + LiCl	GS	5-100	NA	60.0-95.0	239	Uemura	1967	Japan	English
H_2O + LiI	TE	0-80	NA	37.7-94.7	246	Uemura	1969	Japan	Japanese
H_2O + LiI	GTS	0-80	NA	40.0-95.0	246	Uemura	1969	Japan	Japanese

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(1) - mmHg
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A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
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NA - Not Available

Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + DMF	GEP	-15-40	NA	0.0-48.0	54	Ennan	1972	U.S.S.R.	English
H_2O + LiBr: LiSCN (1:1)(M)	TE	5-90	NA	32.0-92.0	84	Iyoki	1981	Japan	Japanese
H_2O + LiBr: LiSCN (1:1)(M)	GS	0-90	NA	35.0-90.0	235	Uemura	1980	Japan	Japanese
H_2O + LiBr: $ZnBr_2$ (1:2.6)(W)	TE	20-80	NA	22.0-90.0	236	Uemura	1983	Japan	Japanese
H_2O + LiBr: $ZnCl_2$ (1:1)(W)	GE	0-250	NA	20.0-40.0	131	Manago	1984	Japan	English
H_2O + LiBr: $ZnCl_2$ (1:1)(W)	GE	0-150	NA	20.0-40.0	156	Ohuchi	1985	Japan	English
H_2O + LiBr: $ZnCl_2$ (1:1)	GP	20-240	NA	38.0-45.0	162	Osaka Gas	1985	Japan	Japanese
H_2O + LiBr: 4,BLN (20:1)(M)	GE	0-100	NA	50.4-100.0	234	Uemura	1981	Japan	Japanese
H_2O + LiBr: 4,BLN (20:1)(M)	TE	0-100	NA	50.4-100.0	87	Iyoki	1983	Japan	Japanese

X - Liquid Phase
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(1) - mmHg
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(2) - mbar
c - ppm by weight of A in Vapor Phase
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NA - Not Available

Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr: 4,BLN (20:1)(M)	TE	0-100	NA	50.4-100.0	88	Iyoki	1984	Japan	English
H_2O + LiBr:EG (10:1)(M)	GTE	40.04-82.32	NA	40.3-100.0	93	Iyoki	1981	Japan	Japanese
H_2O + LiBr:EG (10:1)(M)	TS	20-100	NA	40.0-100.0	93	Iyoki	1981	Japan	Japanese
H_2O + LiBr: $ZnBr_2$:EG	GE	0-60	NA	15.0-80.0	157	Ono	1979	Japan	English
H_2O + LiBr: $ZnBr_2$:EG	GS	10-60	NA	15.0-80.0	157	Ono	1979	Japan	English
A.2.6. Vapor-Liquid-Phase Enthalpies									
H_2O + LiBr	GS	0-170	5-700 (1)	30.0-100.0	121	Lower	1961	Germany	German
H_2O + LiBr	GS	0-100	5-700 (1)	30.0-100.0	72	Hasaba	1961	Japan	Japanese
H_2O + LiBr	GS	0-120	5-700 (1)	30.0-100.0	248	Uemura	1964	Japan	English
H_2O + LiBr	GS	0-120	5-700 (1)	30.0-100.0	232	Uemura	1977	Japan	Japanese

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(1) - mmHg
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A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr	GP	20-240	NA	38.0-45.0	162	Osaka Gas	1985	Japan	Japanese
H_2O + LiBr	TSGP	0-250	0.1-15.5	30.0-100.0	80	Herold	1987	U.S.A.	English
H_2O + LiBr	C GC	-20-200	1.4-7000 (1)	30.0-100.0	261	Usyukin	1969	U.S.S.R.	English
H_2O + LiBr	GS	NA	1-1300 (1)	30.0-100.0	161	Oouchi	1985	Japan	Japanese
H_2O + LiBr	GS	0-200	NA	30.0-100.0	161	Oouchi	1985	Japan	Japanese
H_2O + LiBr	GC	25-149	0.0069-0.400	20.0-100.0	52	Ellington	1957	U.S.A.	English
H_2O + LiBr	GCP	4-182	0.001-0.85	30.0-100.0	137	McNeely	1979	U.S.A.	English
H_2O + LiBr	GS	0-140	0.01-1.0	30-100	121	Lower	1961	Germany	German
H_2O + LiBr	TS	0-130	0.01-1.0	30-100	98	Karavan	1971	U.S.S.R.	Russian
H_2O + LiCl	GS	0-120	2-700 (1)	40.0-100.0	254	Uemura	1965	Japan	Japanese
H_2O + LiCl	GS	0-120	2-700 (1)	40.0-100.0	239	Uemura	1967	Japan	English
H_2O + LiCl	GS	0-120	2-700 (1)	40.0-100.0	232	Uemura	1977	Japan	Japanese

X - Liquid Phase
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(1) - mmHg
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A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiI	GS	0-120	5-750 (1)	15.0-100.0	246	Uemura	1969	Japan	Japanese
H_2O + NaOH	GS	0-120	5-700 (1)	20.0-100.0	255	Uemura	1966	Japan	Japanese
H_2O + H_2SO_4	CP	NA	NA	NA	78	Hasseler	1982	England	English
H_2O + LiBr: LiSCN	GS	0-130	0.007-2.3	30.0-100.0	235	Uemura	1980	Japan	Japanese
H_2O + LiBr: LiSCN (1:1)(M)	GS	0-130	0.007-0.9	30.0-100.0	84	Iyoki	1981	Japan	Japanese
H_2O + LiBr: $ZnBr_2$ (1:2.6)(W)	GS	0-120	1.3-1330 (2)	20.0-100.0	236	Uemura	1983	Japan	Japanese
H_2O + LiBr: $ZnCl_2$ (1:1)(W)	GS	0-250	NA	20.0-40.0	131	Manago	1984	Japan	English
H_2O + LiBr: $ZnCl_2$ (1:1)(W)	GS	0-200	1-5000 (1)	0.0-100.0	156	Ohuchi	1985	Japan	English
H_2O + LiBr: $ZnCl_2$ (1:1)	GP	0-200	1-500 (1)	0.0-100.0	162	Osaka Gas	1985	Japan	Japanese

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NA - Not Available

Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr: $ZnCl_2$ (1:1)	GP	20-240	NA	20.0-34.0	162	Osaka Gas	1985	Japan	Japanese
H_2O + LiBr: $ZnCl_2$	GS	0-200	1.3-4000 (2)	10.0-100.0	229	Uemura	1983	Japan	Japanese
H_2O + LiBr: 4,BLN (20:1) (M)	GS (6)	-30-233	0.03-100 (1)	30.0-100.0	87	Iyoki	1983	Japan	Japanese
H_2O + LiBr: 4,BLN (20:1) (M)	GS (6)	-30-233	0.3-1000 (2)	30.0-100.0	234	Uemura	1981	Japan	Japanese
H_2O + LiBr: 4,BLN (20:1) (M)	GS (6)	-30-233	0.3-1000 (2)	30.0-100.0	88	Iyoki	1984	Japan	English
H_2O + LiBr:EG (10:1) (M)	GS	0-190	2-2000 (1)	25.0-100.0	93	Iyoki	1981	Japan	Japanese
H_2O + LiBr: $ZnBr_2$:EG (1:1)	GS	0-140	NA	0.0-100.0	157	Ono	1979	Japan	English

X - Liquid Phase
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(1) - mmHg
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(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiCl: $CaCl_2$:$Zn(NO_3)_2$ (4.2:2.7:1)(W)	PTE	25	0.003	45-95	168	Pinchuk	1982	U.S.S.R.	Russian
A.2.7. Specfic Heat									
H_2O + LiBr	GTEP	24-130.2	NA	33.8-89.1	71	Uemura	1960	Japan	Japanese
H_2O + LiBr	TEP	24-130	NA	33.8-89.1	248	Uemura	1964	Japan	English
H_2O + LiBr	P	NA	NA	NA	232	Uemura	1977	Japan	Japanese
H_2O + LiBr	GEP	20-100	NA	40.0-90.0	155	Ogawa	1980	Japan	Japanese
H_2O + LiBr	GS	0-80	NA	40.0-100.0	121	Lower	1961	Germany	German
H_2O + LiBr	P GP	0-200	NA	30.0-100.0	261	Usyukin	1969	U.S.S.R.	English
H_2O + LiBr	GE	NA	NA	40.0-100.0	52	Ellington	1957	U.S.A.	English
H_2O + LiBr	P	0-250	0.1-15.5	30.0-100.0	80	Herold	1987	U.S.A.	English
H_2O + LiBr	TE	25	0.004-0.03	45.0-95.0	168	Pinchuk	1982	U.S.S.R.	Russian

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr	TSP	25-135	NA	35.4-40.4	136	Maust	1966	U.S.A.	English
H_2O + LiCl	TEP	10-110	NA	52.1-91.8	253	Uemura	1965	Japan	Japanese
H_2O + LiCl	GS	0-120	NA	60.0-90.0	253	Uemura	1965	Japan	Japanese
H_2O + LiCl	GSP	10-110	NA	52.0-92.0	239	Uemura	1967	Japan	English
H_2O + LiCl	P	NA	NA	NA	232	Uemura	1977	Japan	Japanese
H_2O + LiI	PGS	20-80	NA	40.0-90.0	246	Uemura	1969	Japan	Japanese
H_2O + LiSCN: LiBr (1:1)(M)	GS	0-100	NA	40.0-100.0	84	Iyoki	1981	Japan	Japanese
H_2O + LiSCN: LiBr (1:1)(M)	TEP	5-90	NA	41.0-90.5	84	Iyoki	1981	Japan	Japanese
H_2O + LiSCN: LiBr (1:1)(M)	GSP	0-90	NA	40.5-90.0	235	Uemura	1980	Japan	Japanese
H_2O + LiBr: $ZnBr_2$ (1:2.6)(W)	GEP	10-160	NA	30.4-100.0	236	Uemura	1983	Japan	Japanese

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A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr: 4,BLN (20:1)(M)	GEP	10-70	NA	50.0-100.0	234	Uemura	1981	Japan	Japanese
H_2O + LiBr: 4,BLN (20:1)(M)	TEP	10-70	NA	50.0-100.0	87	Iyoki	1983	Japan	Japanese
H_2O + LiBr: 4,BLN (20:1)(M)	TEP	10-70	NA	50.0-100.0	88	Iyoki	1984	Japan	English
H_2O + LiBr:EG (10:1) (M)	TEP	20-80	NA	50.0-95.0	243	Uemura	1972	Japan	Japanese
H_2O + LiBr:EG (4.5:1)(W)	TE	NA	NA	55.0-75.0	20	Biermann	1978	U.S.A.	English
H_2O + LiCl: $CaCl_2$:$Zn(NO_3)_2$ (4.2:2.7:1)(W)	GS	0-130	0.003-0.03	45.0-95.0	168	Pinchuk	1982	U.S.S.R.	Russian
A.2.9. Viscosity									
H_2O + LiBr	GTE	0-90	NA	39.3-88.6	76	Hasaba	1961	Japan	Japanese
H_2O + LiBr	TS	0-90	NA	60.0-95.0	76	Hasaba	1961	Japan	Japanese

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NA - Not Available

Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr	GE TS	0-90	NA	40.0-90.0	248	Uemura	1964	Japan	English
H_2O + LiBr	TS	0-90	NA	40.0-95.0	232	Uemura	1977	Japan	Japanese
H_2O + LiBr	GS	0-100	NA	30.0-100.0	121	Lower	1961	Germany	German
H_2O + LiBr	GP	20-80	NA	39.0-45.0	162	Osaka Gas	1985	Japan	Japanese
H_2O + LiBr	GS	21-77	NA	40.0-100.0	52	Ellington	1957	U.S.A.	English
H_2O + LiCl	GTE	5-90	NA	57.6-89.2	74	Hasaba	1964	Japan	Japanese
H_2O + LiCl	GTS	5-100	NA	60.0-95.0	74	Hasaba	1964	Japan	Japanese
H_2O + LiCl	TGE	60 & 80	NA	62.4-95.9	239	Uemura	1967	Japan	English
H_2O + LiCl	TS	5-100	NA	60.0-95.0	239	Uemura	1967	Japan	English
H_2O + LiI	GTE	10-80	NA	37.7-94.7	246	Uemura	1969	Japan	Japanese
H_2O + LiI	TS	10-80	NA	40.0-95.0	246	Uemura	1969	Japan	Japanese
H_2O + DMF	GEP	-15-40	NA	0.0-48.0	54	Ennan	1972	U.S.S.R.	English

X - Liquid Phase
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(1) - mmHg
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A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + Utropin	GEP	-10-40	NA	70.0-85.0	54	Ennan	1972	U.S.S.R.	English
H_2O + TEG	GS	20-90	NA	0-100	200	Seher	1985	Germany	German
H_2O + LiBr: LiSCN (1:1)(M)	GTE	5-90	NA	47.3-86.5	84	Iyoki	1981	Japan	Japanese
H_2O + LiBr: LiSCN (1:1)(M)	GS	5-90	NA	40.0-100.0	235	Uemura	1980	Japan	Japanese
H_2O + LiBr: $ZnBr_2$ (1:2.6)(W)	TE	20-80	NA	21.9-90.0	236	Uemura	1983	Japan	Japanese
H_2O + LiBr: $ZnCl_2$ (1:1)(W)	GE	20-80	NA	20.0-40.0	131	Manago	1984	Japan	English
H_2O + LiBr: $ZnCl_2$ (1:1)(W)	GS	20-80	NA	20.0-40.0	156	Ohuchi	1985	Japan	English
H_2O + LiBr: $ZnCl_2$ (1:1)	GP	20-80	NA	20.0-30.0	162	Osaka Gas	1985	Japan	Japanese
H_2O + LiBr: 4,BLN (20:1)(M)	TE	0-100	NA	50.4-100.0	87	Iyoki	1983	Japan	Japanese

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr: 4,BLN (20:1)(M)	GE	20-90	NA	50.4-100.0	87	Iyoki	1983	Japan	Japanese
H_2O + LiBr: 4,BLN (20:1)(M)	TE	0-100	NA	50.4-100.0	88	Iyoki	1984	Japan	English
H_2O + LiBr: 4,BLN (20:1)(M)	GE	20-90	NA	50.4-100.0	88	Iyoki	1984	Japan	English
H_2O + LiBr: 4,BLN (20:1)(M)	GE	20-90	NA	50.4-100.0	234	Uemura	1981	Japan	Japanese
H_2O + LiBr:EG (4.5:1)(W)	TE	49-66	NA	23.0-33.0	20	Biermann	1978	U.S.A.	English
H_2O + LiBr: RbF:CsF	GE	35	NA	25.0	119	Ledding	1965	U.S.A.	English
H_2O + LiBr: $ZnBr_2$:EG	TE	0-60	NA	15.0-80.0	157	Ono	1979	Japan	English
H_2O + LiBr: $ZnBr_2$:EG	GE	10-60	NA	20.0-80.0	157	Ono	1979	Japan	English
H_2O + LiBr: $ZnBr_2$:EG	TE	0-60	NA	15.0-30.0	157	Ono	1979	Japan	English

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(2) - mbar

c - ppm by weight of A in Vapor Phase
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NA - Not Available

Table A.2.0. (Cont.)

A.2.10. Mass Transfer Rate

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr	GE	20	NA	NA	133	Matsuda	1980	Japan	Japanese
H_2O + LiBr	TE	27-41	0.0028-0.026	41.0-43.0	270	Zawacki	1973	U.S.A.	English
H_2O + LiBr	TE	27-41	0.0028-0.026	40.0	271	Zawacki	1973	U.S.A.	English
H_2O + LiBr	GE	25-49	0.0028-0.026	40.0-43.0	41	Deemer	1972	U.S.A.	English
H_2O + LiBr	GE	25	NA	40.0 & 50.0	103	Kashiwagi	1983	Japan	English
H_2O + LiBr	GE	25	NA	40.0-80.0	101	Kashiwagi	1984	Japan	Japanese
H_2O + LiBr	GE	25	NA	40.0-80.0	99	Kashiwagi	1985	Japan	Japanese
A.2.11. Heat Transfer Rate									
H_2O + LiBr	GS	0-100	NA	30.0-100.0	121	Lower	1961	Germany	German
H_2O + LiBr	GS	0-100	NA	40.0-100.0	121	Lower	1961	Germany	German
H_2O + LiBr	GS	30-120	NA	60.0	108	Knoche	1987	Germany	English
H_2O + LiBr: Baysilone	GS	30-120	NA	60.0	108	Knoche	1987	Germany	English

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + CH_3OH: LiBr	GS	5-100	NA	60.0	108	Knoche	1987	Germany	English
H_2O + LiBr:EG (4.5:1)(W)	TE	86	NA	26.9-32.4	20	Biermann	1978	U.S.A.	English
H_2O + LiBr: RbF:CsF	GE	NA	NA	15.0-45.0	119	Ledding	1965	U.S.A.	English
A.2.12. Thermal Conductivity									
H_2O + LiBr	GTE	10-80	NA	39.7-86.9	251	Uemura	1963	Japan	Japanese
H_2O + LiBr	GTS	0-100	NA	35.0-95.0	251	Uemura	1963	Japan	Japanese
H_2O + LiBr	TGE TS	10-80	NA	40.0-90.0	248	Uemura	1964	Japan	English
H_2O + LiBr	TS	0-100	NA	35.0-95.0	232	Uemura	1977	Japan	Japanese
H_2O + LiBr	GS	0-80	NA	40.0-100.0	121	Lower	1961	Germany	German
H_2O + LiCl	GTE	10-90	NA	59.4-90.0	74	Hasaba	1964	Germany	Japanese
H_2O + LiCl	GTS	5-100	NA	60.0-95.0	74	Hasaba	1964	Japan	Japanese

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Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiCl	TGE	20	NA	62.0-89.9	239	Uemura	1967	Japan	English
H_2O + LiCl	TE	10-90	NA	60.0-90.0	239	Uemura	1967	Japan	English
H_2O + LiCl	TS	5-100	NA	60.0-95.0	239	Uemura	1967	Japan	English
A.2.13. Refractive Index									
H_2O + LiBr: LiCl (2:1)(M)	TGE	NA	NA	40.0-100.0	247	Uemura	1970	Japan	Japanese
A.2.14. Entropy									
H_2O + LiBr	GS	0-120	2-700 (1)	30.0-100.0	248	Uemura	1964	Japan	English
H_2O + LiBr	GS	0-120	2-700 (1)	30.0-100.0	77	Hasaba	1964	Japan	Japanese
H_2O + LiBr	GS	0-120	2-700 (1)	30.0-100.0	232	Uemura	1977	Japan	Japanese
H_2O + LiBr	P	0-250	0.1-15.5	30.0-100.0	80	Herold	1987	U.S.A.	English
H_2O + LiBr	GS	0-140	0.001-1.0	30.0-100.0	121	Lower	1961	Germany	German
H_2O + LiBr	GTSP	0-100	0.001-1.0	30.0-100.0	110	Koehler	1987	U.S.A.	English

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NA - Not Available

Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr	GS	0-120	0.002-1.0	30.0-100.0	98	Karavan	1971	U.S.S.R.	Russian
H_2O + LiBr	GTS	-100-200	0.002-15.0	0.0-100.0	193	Rosenfeld	1971	U.S.S.R.	Russian
H_2O + LiBr	TS	0-200	0.001-15.0	35.0-10.0	69	Gupta	1976	U.S.A.	English
H_2O + LiCl	GS	0-120	5-700 (1)	40.0-100.0	258	Uemura	1966	Japan	Japanese
H_2O + LiCl	GS	0-120	5-700 (1)	40.0-100.0	239	Uemura	1967	Japan	English
A.2.15. Surface Tension									
H_2O + LiBr	TE	0-80	NA	42.0-89.6	76	Hasaba	1961	Japan	Japanese
H_2O + LiBr	GTS	0-90	NA	40.0-95.0	76	Hasaba	1961	Japan	Japanese
H_2O + LiBr + n-octanol	GE	20-80	NA	NA	92	Iyoki	1977	Japan	Japanese
H_2O + LiBr	GTS	0-90	NA	40.0-95.0	248	Uemura	1964	Japan	English
H_2O + LiBr	TS	0-90	NA	40.0-95.0	232	Uemura	1977	Japan	Japanese
H_2O + LiBr + n-octanol	GE	20-80	NA	NA	227	Uemura	1976	Japan	Japanese

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NA - Not Available

Table A.2.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
H_2O + LiBr	GS	0-100	NA	40.0-100.0	121	Lower	1961	Germany	German
H_2O + LiBr + n-octanol	GE	20	NA	50.0	102	Kashiwagi	1985	Japan	Japanese
H_2O + LiBr + n-octanol	GE	20	NA	50.0	100	Kashiwagi	1984	Japan	Japanese
H_2O + LiBr + n-octanol	GE	20	NA	50.0	99	Kashiwagi	1985	Japan	Japanese
H_2O + LiCl	GTE	5-90	NA	60.8-90.3	74	Hasaba	1964	Japan	Japanese
H_2O + LiCl	GTS	5-100	NA	60.0-95.0	74	Hasaba	1964	Japan	Japanese
H_2O + LiCl	TS	5-100	NA	60.0-95.0	239	Uemura	1967	Japan	English
H_2O + LiI	GTE	5-80	NA	37.7-88.0	246	Uemura	1969	Japan	Japanese
H_2O + LiI	TS	0-80	NA	40.0-90.0	246	Uemura	1969	Japan	Japanese
H_2O + LiBr: $ZnBr_2$ (1:2.6)(W)	TE	20-80	NA	22.0-70.0	236	Uemura	1983	Japan	Japanese

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Table A.3.0. ALCOHOLS BINARY AND MULTICOMPONENT ABSORPTION FLUIDS PROPERTIES DATA

A.3.1. Vapor-Liquid Equilibrium

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
CH_3OH + LiBr	TEP	-10-140	1-1000 (2)	40.0-75.0	183	Renz	1981	Germany	German
CH_3OH + LiBr	GS	-10-140	1-1000 (2)	0.0-100.0	183	Renz	1981	Germany	German
CH_3OH + LiBr	GS	-20-140	1-1000 (2)	0.0-100.0	218	Steimle	1981	Germany	English
CH_3OH + LiBr	GS	-20-140	1-1000 (2)	0.0-100.0	219	Steimle	1981	Germany	English
CH_3OH + LiBr	TGEP	20-70	0-3000 (1)	52.3-89.8	245	Uemura	1965	Japan	Japanese
CH_3OH + LiBr	GS GTP	0-100	0-3000 (1)	40.0-90.0	245	Uemura	1965	Japan	Japanese
CH_3OH + LiBr	GE	3-227	0.1-100	45.0-100.0	16	Belherazem	1982	Germany	English
CH_3OH + LiBr	TP	20-70	30.3-584 (1)	62.3-89.8	244	Uemura	1972	Japan	Japanese
CH_3OH + LiBr	GS	20-150	0.008-0.24	39.6-64.3	19	Biermann	1978	U.S.A.	English
CH_3OH + LiBr	TE	32-124	0.010-0.965	43.9-92.3	1	Aker	1965	U.S.A.	English
CH_3OH + LiBr	GE	33-38	0.043-0.052	Sat. at 25°C	119	Ledding	1965	U.S.A.	English

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NA - Not Available

Table A.3.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
CH_3OH + LiBr	TE	-10-170.5	1.4-3070 (2)	39.7-74.7	185	Renz	1981	Germany	English
CH_3OH + LiBr	TE	-10-140	1.4-1005.8 (2)	39.7-74.7	182	Renz	1980	Germany	German
CH_3OH + LiBr	GS	-20-160	1-3000 (2)	40-100	185	Renz	1981	Germany	English
CH_3OH + LiBr	GS	-20-140	2-1000 (2)	0-100	182	Renz	1980	Germany	German
CH_3OH + LiBr	GE	-10-110	0.002-0.8	50-100	58	Felli	1979	Italy	English
CH_3OH + LiBr	TE	35-100	0.02-0.72	50	58	Felli	1979	Italy	English
CH_3OH + LiBr	GS	-20-100	0.05-1	20-60	48	Eichholz	1982	Germany	German
CH_3OH + LiBr	TGEP	20-100	0.02-5	69.3-100	48	Eichholz	1982	Germany	German
CH_3OH + LiBr	GE	20-100	0-4	69.3-100	48	Eichholz	1982	Germany	German
CH_3OH + $ZnBr_2$	GS	-20-110	5-1000 (2)	26-100	184	Renz	1981	Germany	German
CH_3OH + $ZnBr_2$	GE	-10-110	0.006-1.6	30-100	58	Felli	1979	Italy	English
CH_3OH + $ZnBr_2$	TGEP	20-100	0.05-1	76.2-98.4	48	Eichholz	1982	Germany	German
CH_3OH + $ZnBr_2$	GE	20-100	0-3.5	76.2-98.4	48	Eichholz	1982	Germany	German

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Table A.3.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$CH_3OH + ZnBr_2$	TE	30-109	0.034-0.931	25.8-65.4	1	Aker	1965	U.S.A.	English
$CH_3OH + ZnBr_2$	GE	31	0.034	Sat. at 25°C	119	Ledding	1965	U.S.A.	English
$CH_3OH + ZnBr_2$	GTEP	23.5-59.9	39.5-495.8 (1)	28.4-92.0	241	Uemura	1976	Japan	Japanese
$CH_3OH + ZnBr_2$	TEP	-20-110	2-983.8 (2)	18.3-48.5	183	Renz	1981	Germany	German
$CH_3OH + ZnBr_2$	GS	20-100	5-1000 (2)	26.0-100.0	183	Renz	1981	Germany	German
$CH_3OH + LiCl$	TE	35-89	0.058-0.807	72.8-87.2	1	Aker	1965	U.S.A.	English
$CH_3OH + LiCl$	GE	26	0.037	Sat. at 25°C	119	Ledding	1965	U.S.A.	English
$CH_3OH + LiSCN$	TEP	-10-160	5-1000 (2)	38.0-84.0	183	Renz	1981	Germany	German
$CH_3OH + ZnCl_2$	GS	4-71	0.013-0.613	26.0-57.1	119	Ledding	1965	U.S.	English
$CH_3OH + LiSCN$	GS	-20-160	1-1000 (2)	40.0-100.0	183	Renz	1981	Germany	German
$CH_3OH + H_2O$	GS	-20-120	3-2000 (2)	0.0-100.0	108	Knoche	1987	Germany	English
$CH_3OH + EG$	GS	10-130	0.02-1	2.6-100	57	Felli	1981	Italy	English
$CH_3OH + EG$	GS	10-130	NA	18-82	57	Felli	1981	Italy	English

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Table A.3.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
CH_3OH + EG	TEC	8.6-110	0.02-1	10-60	57	Felli	1981	Italy	English
CH_3OH + LiBr: $ZnBr_2$ (1:1)(M)	GS	-20-120	1-1000 (2)	20-100	184	Renz	1981	Germany	German
CH_3OH + LiBr: $ZnBr_2$ (2:1)(M)	GEP	0-100	10-10,000 (1)	60.0-90.0	249	Uemura	1969	Japan	Japanese
CH_3OH + LiBr: $ZnBr_2$ (2:1)(M)	GP	0-100	10-10,000 (1)	40.0-100.0	249	Uemura	1969	Japan	Japanese
CH_3OH + LiBr: $ZnBr_2$ (2:1)(M)	TP	20-70	39.88-860.3 (1)	60.0-90.0	244	Uemura	1972	Japan	Japanese
CH_3OH + LiBr: $ZnBr_2$ (1:1)(M)	TEP	-25-130	1-1000 (2)	20.0-100.0	183	Renz	1981	Germany	German
CH_3OH + LiBr: $ZnBr_2$ (1:1)(M)	GS	-20-120	1-1000 (2)	20.0-100.0	183	Renz	1981	Germany	German
CH_3OH + LiBr: $ZnBr_2$ (1:1)(M)	GS	-20-120	1-1000 (2)	20.0-100.0	180	Renz	1982	Germany	English
CH_3OH + LiBr: $ZnBr_2$ (1:1)(M)	GS	-20-120	1-1000 (2)	20.0-100.0	219	Steimle	1981	Germany	German

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Table A.3.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
CH_3OH + LiBr: $ZnBr_2$ (1:1)(M)	GS	-20-120	1-1000 (2)	20.0-100.0	218	Steimle	1981	Germany	German
CH_3OH + LiBr: $ZnBr_2$ (2:1)(M)	GS	0-150	0.008-0.24	25.0-55.0	19	Biermann	1978	U.S.A.	English
CH_3OH + LiBr: $ZnBr_2$ (4:1)(M)	TE	54-128	0.022-0.814	35.7	1	Aker	1965	U.S.A.	English
CH_3OH + LiBr: $ZnBr_2$ (2:1)(M)	TE	30-139	0.012-0.917	27.8-56.7	1	Aker	1965	U.S.A.	English
CH_3OH + LiBr: $ZnBr_2$ (0.5:1)(M)	TE	29-134	0.028-0.910	24.4-39.8	1	Aker	1965	U.S.A.	English
CH_3OH + LiI: $ZnBr_2$ (2:1)(M)	GTEP	20-70	18.2-758 (1)	50.4-86.0	240	Uemura	1975	Japan	Japanese
CH_3OH + LiI: $ZnBr_2$ (2:1)(M)	GP	0-100	0-1000 (1)	50.0-100.0	240	Uemura	1975	Japan	Japanese
CH_3OH + LiI: $ZnBr_2$ (2:1)(M)	GEP	0-110	1-2500 (1)	50.4-100.0	228	Uemura	1973	Japan	German

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Table A.3.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
CH_3OH + LiI: $ZnBr_2$ (2:1)(M)	TP	20-70	30-769 (1)	56.8-85.3	244	Uemura	1972	Japan	Japanese
CH_3OH + LiBr: LiCl (0.5:1)(M)	TE	30-89	0.039-0.786	67.8-80.0	1	Aker	1965	U.S.A.	English
CH_3OH + LiCl: $ZnBr_2$ (2:1)(M)	TE	30-115	0.030-1.055	41.0-71.4	1	Aker	1965	U.S.A.	English
CH_3OH + H_2O: LiBr	GS	60 & 100	NA	0.0-100.0	108	Knoche	1987	Germany	English
CH_3OH + H_2O: LiBr	GS	-10-120	10-1000 (2)	NA	108	Knoche	1987	Germany	German
C_2H_5OH + LiBr	TE	35-114	0.011-0.903	51.9-66.6	1	Aker	1965	U.S.A.	English
C_2H_5OH + LiBr	GE	28	0.024	Sat. at 25°C	119	Ledding	1965	U.S.A.	English
C_2H_5OH + LiBr	TGEP	20-70	26.3-475 (1)	50.5-90.0	233	Uemura	1975	Japan	Japanese
C_2H_5OH + LiCl	GE	26	0.024	Sat. at 25°C	119	Ledding	1965	U.S.A.	English
C_2H_5OH + LiI	TGEP	29.9-72.38	12.24-384.57 (1)	50.7-94.7	86	Iyoki	1982	Japan	Japanese

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A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.3.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
C_2H_5OH + LiI	GS	25-110	0-300 (1)	40.0 & 60.0	86	Iyoki	1982	Japan	Japanese
C_2H_5OH + $ZnCl_2$	GE	26	0.034	Sat. at 25°C	119	Ledding	1965	U.S.A.	English
C_2H_5OH + $ZnBr_2$	GE	26	0.034	Sat. at 25°C	119	Ledding	1965	U.S.A.	English
C_2H_5OH + H_2O	TE	54-120	1-2	0.0-100.0	34	Bosnjakovic	1931	Germany	German
C_2H_5OH + LiBr: $ZnBr_2$ (2:1)(M)	TE	55-138	0.012-0.876	39.2-50.1	1	Aker	1965	U.S.A.	English
C_3H_7OH + $ZnCl_2$	GE	26	0.0076	Sat. at 25°C	119	Ledding	1965	U.S.A.	English
C_3H_7OH + LiCl	GE	26	0.0097	Sat. at 25°C	119	Ledding	1965	U.S.A.	English
C_3H_7OH + $ZnBr_2$	GE	33	0.019	Sat. at 25°C	119	Ledding	1965	U.S.A.	English
A.3.2. Crystallization Temperature									
CH_3OH + LiBr	GTE	0-40	NA	41.7-42.0	158	Oosaba	1950	Japan	Japanese
CH_3OH + LiBr	GTE	-11.3-120.2	NA	39.2-43.6	245	Uemura	1965	Japan	Japanese
CH_3OH + LiBr	GTE	20-100	NA	41.5-59.3	185	Renz	1981	Germany	English
CH_3OH + LiBr	GTE	20-100	NA	41.5-59.3	182	Renz	1980	Germany	German

X - Liquid Phase
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(1) - mmHg

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(2) - mbar

c - ppm by weight of A in Vapor Phase
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NA - Not Available

Table A.3.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
CH_3OH + LiBr	TE	18 & 25	NA	41.7 & 46.1	164	Pavlopoulos	1954	Germany	German
CH_3OH + LiBr	GS	0-70	NA	50 & 100	181	Renz	1978	Germany	German
CH_3OH + LiBr	TE	15.5-100	NA	40.0-59.0	183	Renz	1981	Germany	German
CH_3OH + LiCl	TE	18 & 25	NA	69.4 & 70.9	164	Pavlopoulos	1954	Germany	German
CH_3OH + LiCl	GTE	0-30	NA	69.5	158	Oosaba	1950	Japan	Japanese
CH_3OH + LiI	TE	-17-113	NA	22.0-64.0	183	Renz	1981	Germany	German
CH_3OH + LiI	TE	18 & 25	NA	36.9 & 41.1	164	Pavlopoulos	1954	Germany	German
CH_3OH + LiSCN	TE	9.3-90	NA	38.0-44.0	183	Renz	1981	Germany	German
CH_3OH + $ZnBr_2$	GTE	0-80	NA	18.9-32.9	241	Uemura	1976	Japan	Japanese
CH_3OH + NaF	TE	18 & 25	NA	99.9 & 99.9	164	Pavlopoulos	1954	Germany	German
CH_3OH + NaCl	TE	18 & 25	NA	98.6 & 98.7	164	Pavlopoulos	1954	Germany	German
CH_3OH + NaBr	TE	18 & 25	NA	85.2 & 86.0	164	Pavlopoulos	1954	Germany	German
CH_3OH + NaI	TE	18 & 25	NA	54.6 & 58.1	164	Pavlopoulos	1954	Germany	German

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Table A.3.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
CH_3OH + KF	TE	18 & 25	NA	91	164	Pavlopoulos	1954	Germany	German
CH_3OH + KCl	TE	18 & 25	NA	99.4 & 99.5	164	Pavlopoulos	1954	Germany	German
CH_3OH + KBr	TE	18 & 25	NA	97.9 & 98.0	164	Pavlopoulos	1954	Germany	German
CH_3OH + KI	TE	18 & 25	NA	85.5 & 85.9	164	Pavlopoulos	1954	Germany	German
CH_3OH + RbCl	TE	18 & 25	NA	98.7 & 98.7	164	Pavlopoulos	1954	Germany	German
CH_3OH + RbBr	TE	18 & 25	NA	97.6	164	Pavlopoulos	1954	Germany	German
CH_3OH + RbI	TE	18 & 25	NA	90.8	164	Pavlopoulos	1954	Germany	German
CH_3OH + CsCl	TE	18 & 25	NA	96.8 & 97.1	164	Pavlopoulos	1954	Germany	German
CH_3OH + CsBr	TE	18 & 25	NA	97.8 & 97.9	164	Pavlopoulos	1954	Germany	German
CH_3OH + CsI	TE	18 & 25	NA	96.4 & 97.1	164	Pavlopoulos	1954	Germany	German
CH_3OH + LiBr: $ZnBr_2$ (1:1)(M)	GS	5-145	NA	12-17	184	Renz	1981	Germany	German
CH_3OH + LiBr: $ZnBr_2$ (1:1)(M)	TE	9-129	NA	12.0-19.0	183	Renz	1981	Germany	German

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M - Mole, W - Weight
NA - Not Available

Table A.3.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
CH_3OH + LiBr: $ZnBr_2$ (2:1)(M)	GE	-10-80	NA	28.0-60.0	249	Uemura	1969	Japan	Japanese
CH_3OH + H_2O: LiBr	GS	-25-60	NA	0.0-100.0	108	Knoche	1987	Germany	German
CH_3OH + LiI: $ZnBr_2$ (2:1)(M)	TE	-12-75	NA	34.1-40.7	228	Uemura	1973	Japan	German
CH_3OH + LiI: $ZnBr_2$ (2:1)(M)	GE	-10-70	NA	35.0-40.0	240	Uemura	1975	Japan	Japanese
C_2H_5OH + LiBr	GE	0-90	NA	51.0-77.0	233	Uemura	1975	Japan	Japanese
C_2H_5OH + LiI	GTE	-17.73-196.33	NA	25.8-68.2	86	Iyoki	1982	Japan	Japanese
nC_3H_7OH + LiBr	GTE	0-40	NA	58.6	158	Oosaba	1950	Japan	Japanese
A.3.4. Heat of Mixing									
CH_3OH + LiBr	GE	NA	NA	40.0-100.0	245	Uemura	1965	Japan	Japanese
CH_3OH + LiBr	TGE	25 & 40	NA	45.0-100.0	48	Eichholz	1982	Germany	German

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(2) - mbar
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NA - Not Available

Table A.3.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
C_2H_5OH + LiBr	GE	NA	NA	40.0-100.0	233	Uemura	1975	Japan	Japanese
CH_3OH + $ZnBr_2$	TGE	NA	NA	30.0-100.0	241	Uemura	1976	Japan	Japanese
CH_3OH + $ZnBr_2$	TGE	40	NA	30.0-100.0	48	Eichholz	1982	Germany	German
CH_3OH + LiBr: $ZnBr_2$ (2:1)(M)	GE	NA	NA	30.0-100.0	249	Uemura	1969	Japan	Japanese
CH_3OH + LiBr: $ZnBr_2$ (2:1)(M)	TGE	40	NA	30.0-100.0	48	Eichholz	1982	Germany	German
CH_3OH + LiI: $ZnBr_2$ (2:1)(M)	GE	NA	NA	40-100.0	240	Uemura	1975	Japan	Japanese
CH_3OH + LiI: $ZnBr_2$ (2:1)(M)	GS	NA	NA	0.0-100.0	228	Uemura	1973	Japan	German
C_2H_5OH + LiI	TGS	35	NA	44.0-96.0	86	Iyoki	1982	Japan	Japanese
C_2H_5OH + H_2O	GS	0-100	NA	NA	34	Bosnjakovic	1931	Germany	German
A.3.5. Liquid-Phase Densities									
CH_3OH + LiBr	TGE	5-95	NA	51.0-94.0	245	Uemura	1965	Japan	Japanese

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(2) - mbar

c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.3.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
CH_3OH + LiBr	TS	5-95	NA	55.0-95.0	245	Uemura	1965	Japan	Japanese
CH_3OH + LiBr	GE	5-90	NA	41.5-100.0	185	Renz	1981	Germany	English
CH_3OH + LiBr	TEP	5-90	NA	42.0-89.0	183	Renz	1981	Germany	German
CH_3OH + LiBr	GS	10-90	NA	40.0-100.0	185	Renz	1981	Germany	German
CH_3OH + LiBr	GS	10-90	NA	40.0-100.0	183	Renz	1981	Germany	German
CH_3OH + LiBr	GS	10-90	NA	40.0-100.0	182	Renz	1980	Germany	German
CH_3OH + LiI	TEP	20-90	NA	26.0-98.0	183	Renz	1981	Germany	German
CH_3OH + LiI	GS	20-100	NA	20.0-100.0	183	Renz	1981	Germany	German
CH_3OH + $ZnBr_2$	GTE	5-60	NA	40.0-94.0	241	Uemura	1976	Japan	Japanese
CH_3OH + $ZnBr_2$	TS	5-60	NA	40.0-95.0	241	Uemura	1976	Japan	Japanese
CH_3OH + LiSCN	TEP	20-90	NA	44.0-98.0	183	Renz	1981	Germany	German
CH_3OH + LiSCN	GS	20-90	NA	40.0-100.0	183	Renz	1981	Germany	German

X - Liquid Phase
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(1) - mmHg
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A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.3.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
CH_3OH + LiBr: $ZnBr_2$ (2:1)(M)	TE	10-80	NA	37.6-90.0	249	Uemura	1969	Japan	Japanese
CH_3OH + LiBr: $ZnBr_2$ (2:1)(M)	TGS	10-90	NA	40.0-95.0	249	Uemura	1969	Japan	Japanese
CH_3OH + LiBr: $ZnBr_2$ (1:1)(M)	TEP	20-90	NA	20.0-100.0	183	Renz	1981	Germany	German
CH_3OH + LiBr: $ZnBr_2$ (1:1)(M)	GS	20-100	NA	20.0-100.0	183	Renz	1981	Germany	German
CH_3OH + LiI: $ZnBr_2$ (2:1)(M)	GTE	5-80	NA	48.7-95.0	240	Uemura	1975	Japan	Japanese
CH_3OH + LiI: $ZnBr_2$ (2:1)(M)	GS	0-80	NA	48.7-100.0	228	Uemura	1973	Japan	German
C_2H_5OH + LiBr	GE TS	5-60	NA	60.0-95.0	233	Uemura	1975	Japan	Japanese
A.3.6. Vapor-Liquid-Phase Enthalpies									
CH_3OH + LiBr	GS	-30-120	2-2000 (2)	0-70	245	Uemura	1965	Japan	Japanese

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(2) - mbar

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NA - Not Available

Table A.3.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
CH_3OH + LiBr	GS	-30-140	0.001-5	40.0-100.0	48	Eichholz	1982	Germany	German
CH_3OH + $ZnBr_2$	GS	0-120	2-760 (1)	20.0-100.0	241	Uemura	1976	Japan	Japanese
CH_3OH + LiI: $ZnBr_2$ (2:1)(M)	GS	-60-120	2-2000 (1)	20.0-100.0	228	Uemura	1973	Japan	German
CH_3OH + LiI: $ZnBr_2$ (2:1)(M)	GS	-60-120	2-2000 (1)	30.0-100.0	240	Uemura	1975	Japan	Japanese
CH_3OH + LiBr: $ZnBr_2$ (2:1)(M)	GS	-30-120	2-2000 (1)	15.0-100.0	249	Uemura	1969	Japan	Japanese
C_2H_5OH + LiBr	GS	0-120	2-760 (1)	30.0-100.0	233	Uemura	1975	Japan	Japanese
C_2H_5OH + LiI	GS	-29.85-130.15	0.1-4000 (2)	20.0-100.0	86	Iyoki	1982	Japan	Japanese
C_2H_5OH + H_2O	TE	54-120	1-2	0.0-100.0	34	Bosnjakovic	1931	Germany	German
C_2H_5OH + H_2O	TE	18-107	1.6-4	10.0-97.0	34	Bosnjakovic	1931	Germany	German
C_2H_5OH + H_2O	TGS	0-100	NA	0.0-100.0	34	Bosnjakovic	1931	Germany	German

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Table A.3.0. (Cont.)

A.3.7. Specific Heat

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
CH_3OH + LiBr	GS	10-80	NA	50.0-90.0	245	Uemura	1965	Japan	Japanese
CH_3OH + LiBr	TEP	10-80	NA	55.0-89.7	245	Uemura	1965	Japan	Japanese
CH_3OH + $ZnBr_2$	GTEP	15-55	NA	39.9-90.6	241	Uemura	1976	Japan	Japanese
CH_3OH + LiI: $ZnBr_2$ (2:1)(M)	TEP	5-60	NA	48.7-95.0	240	Uemura	1975	Japan	Japanese
CH_3OH + LiI: $ZnBr_2$ (2:1)(M)	P	NA	NA	NA	228	Uemura	1973	Japan	German
CH_3OH + LiBr: $ZnBr_2$ (2:1)(M)	GS	0-80	NA	40.0-100.0	249	Uemura	1969	Japan	Japanese
C_2H_5OH + LiBr	TEP	15-65	NA	58.1-95.1	233	Uemura	1975	Japan	Japanese
C_2H_5OH + LiI	TEP	15-65	NA	44.3-91.9	86	Iyoki	1982	Japan	Japanese
A.3.8. Stability									
CH_3OH + LiBr	GE	175	2-18 (2)	45.0	16	Belherazem	1982	Germany	English

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(2) - mbar
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M - Mole, W - Weight
NA - Not Available

Table A.3.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
CH_3OH + LiBr: $ZnBr_2$	TE	100-200	0.1-38 (1)	28.0	109	Koebel	1981	Germany	German
A.3.9. Viscosity									
CH_3OH + LiBr	TGEC	5-95	NA	49.0-100.0	245	Uemura	1965	Japan	Japanese
CH_3OH + LiBr	TS	5-95	NA	55.0-95.0	245	Uemura	1965	Japan	Japanese
CH_3OH + LiBr	GE	NA	10-1050 (1)	60.0-95.0	245	Uemura	1965	Japan	Japanese
CH_3OH + LiBr	TEP	10-90	NA	43.0-82.0	183	Renz	1981	Germany	German
CH_3OH + LiBr	GS	10-90	NA	40.0-80.0	183	Renz	1981	Germany	German
CH_3OH + LiI	TEP	20-90	NA	26.0-58.0	183	Renz	1981	Germany	German
CH_3OH + LiI	GS	20-90	NA	20.0-60.0	183	Renz	1981	Germany	German
CH_3OH + LiSCN	TEP	20-90	NA	40.0-72.0	183	Renz	1981	Germany	German
CH_3OH + LiSCN	GS	20-90	NA	40.0-80.0	183	Renz	1981	Germany	German
CH_3OH + $ZnBr_2$	GTE	5-60	NA	40.0-94.0	241	Uemura	1969	Japan	Japanese

X - Liquid Phase
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(1) - mmHg
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(2) - mbar
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NA - Not Available

Table A.3.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$CH_3OH + ZnBr_2$	TS	5-60	NA	40.0-95.0	241	Uemura	1969	Japan	Japanese
CH_3OH + LiBr: $ZnBr_2$ (2:1)(M)	TE	10-90	NA	37.6-90.0	249	Uemura	1969	Japan	Japanese
CH_3OH + LiBr: $ZnBr_2$ (2:1)(M)	TS	10-90	NA	45.0-95.0	249	Uemura	1969	Japan	Japanese
CH_3OH + LiBr: $ZnBr_2$ (2:1)(M)	GS	-10-80	NA	29.0-50.0	249	Uemura	1969	Japan	Japanese
CH_3OH + LiBr: $ZnBr_2$ (2:1)(M)	GE	NA	5-800 (3)	50.0-90.0	249	Uemura	1969	Japan	Japanese
CH_3OH + LiBr: $ZnBr_2$ (1:1)(M)	TEP	20-90	NA	20.0-50.0	183	Renz	1981	Germany	German
CH_3OH + LiBr: $ZnBr_2$ (1:1)(M)	GS	20-90	NA	20.0-50.0	183	Renz	1981	Germany	German
CH_3OH + LiI: $ZnBr_2$ (2:1)(M)	GTE	5-80	NA	48.7-95.0	249	Uemura	1975	Japan	Japanese
CH_3OH + LiI: $ZnBr_2$ (2:1)(M)	GS	5-60	NA	49.0-100.0	228	Uemura	1973	Japan	German

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Table A.3.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
C_2H_5OH + LiBr	TGE	5-60	NA	60.0-95.0	233	Uemura	1975	Japan	Japanese
A.3.11. Heat Transfer Rate									
CH_3OH + H_2O: LiBr	GS	5-100	NA	NA	108	Knoche	1987	Germany	German

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Table A.4.0. AMINES BINARY AND MULTICOMPONENT ABSORPTION FLUIDS PROPERTIES DATA

A.4.1. Vapor-Liquid Equilibrium

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
CH_3NH_2 + NaSCN	TEP	25-120	0.486-26.1	46.0-64.7	194	Rush	1967	U.S.A.	English
CH_3NH_2 + NaSCN	GS	15-95	1.38-8.27	49.6-68.5	18	Biermann	1978	U.S.A.	English
CH_3NH_2 + LiSCN	TEP	26-141	0.064-13.2	43.8-79.5	126	Macriss	1970	U.S.A.	English
CH_3NH_2 + LiSCN	GS	49-142	1.38-8.27	48.1-62.9	18	Biermann	1978	U.S.A.	English
CH_3NH_2 + LiSCN	GE	20	0.9	0.65	180	Renz	1982	Germany	English
CH_3NH_2 + $LiNO_3$	GE	20	0.9	0.45	180	Renz	1982	Germany	English
CH_3NH_2 + LiSCN	GS	20-60	NA	60-68	27	Bokelmann	1983	Germany	English
CH_3NH_2 + LiSCN	GS	20-60	NA	60-68	46	Ehmke	1983	Germany	English
CH_3NH_2 + $Zn(SCN)_2$	TE	35-48	48.3-8.27	44.0	19	Biermann	1978	U.S.A.	English
CH_3NH_2 + $Ni(SCN)_x$	TE	9-145	1.38-6.89	34.4-66.5	19	Biermann	1978	U.S.A.	English

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Table A.4.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
CH_3NH_2 + $Co(SCN)_2$	TE	65-157	1.38-8.27	19.7-37.3	19	Biermann	1978	U.S.A.	English
CH_3NH_2 + CuSCN	TE	63-139	1.38-8.27	21.0-40.9	19	Biermann	1978	U.S.A.	English
CH_3NH_2 + $Cu(SCN)_2$	TE	50-105	4.83-8.27	39.4-51.5	19	Biermann	1978	U.S.A.	English
CH_3NH_2 + H_2O	P	NA	NA	NA	257	Uemura	1967	Japan	Japanese
CH_3NH_2 + H_2O	GS	-40-120	0.1-5.0	0.0-100.0	138	Mehl	1935	Germany	German
CH_3NH_2 + H_2O	GS	-30-160	0.2-8.0	0.0-100.0	138	Mehl	1935	Germany	German
CH_3NH_2 + H_2O	GS	0-70	NA	0-100	181	Renz	1978	Germany	German
CH_3NH_2 + EG	TEP	-10-180	0.22-10 (2)	10-40	47	Ehmke	1984	Germany	German
CH_3NH_2 + EG	GTS	-20-180	0.2-10 (2)	10-100	47	Ehmke	1984	Germany	German
CH_3NH_2 + EG	GS	-20-180	0.2-10 (2)	10-100	31	Bokelmann	1985	Germany	German
CH_3NH_2 + EG	GE	40	NA	8.1-66.7	190	Roberson	1966	U.S.A.	English
CH_3NH_2 + EG	GS	20-60	NA	25-35	27	Bokelmann	1983	Germany	English

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NA - Not Available

Table A.4.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
CH_3NH_2 + EG	GS	20-60	NA	25-35	46	Ehmke	1983	Germany	English
CH_3NH_2 + TEG	GE	40 & 49	NA	2.7-39.0	190	Roberson	1966	U.S.A.	English
CH_3NH_2 + TEG	GE	20-60	0.9 (2)	0.1-0.20	180	Renz	1982	Germany	English
CH_3NH_2 + TEG	GS	20-60	NA	10-15	27	Bokelmann	1983	Germany	English
CH_3NH_2 + TEG	GS	20-60	NA	10-15	46	Ehmke	1983	Germany	English
CH_3NH_2 + MEDEG	G	40	NA	14.9-81.5	190	Roberson	1966	U.S.A.	English
CH_3NH_2 + 1,4 BDL	GS	20-60	0.9 (2)	0.15-0.35	180	Renz	1982	German	English
CH_3NH_2 + 1,4 BDL	GE	40	NA	5.7-58.0	190	Roberson	1966	U.S.A.	English
CH_3NH_2 + 1,4 BDL	GS	20-60	NA	20-30	27	Bokelmann	1983	Germany	English
CH_3NH_2 + 1,4 BDL	GS	20-60	NA	20-30	46	Ehmke	1983	Germany	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.4.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
CH_3NH_2 + (GLY)	GS	20-60	0.9 (2)	0.15-0.40	180	Renz	1982	Germany	English
CH_3NH_2 + GLY	GS	20-60	NA	20-35	27	Bokelmann	1983	Germany	English
CH_3NH_2 + GLY	GS	20-60	NA	20-35	46	Ehmke	1983	Germany	English
CH_3NH_2 + DMETEG	GE	40	NA	2.4-35.9	190	Roberson	1966	U.S.A.	English
CH_3NH_2 + NaSCN:LiSCN (4:1)(W)	TE	39-136	1.38-7.58	30.6-53.4	19	Biermann	1978	U.S.A.	English
CH_3NH_2 + NaSCN:LiSCN (1.63:1)(W)	TE	48-148	1.38-7.58	26.4-54.3	19	Biermann	1978	U.S.A.	English
CH_3NH_2 + H_2O: LiBr (2:3)(W)	GE TGS	20-200	0.7-20 (2)	0-100 0-100	177	Radermacher	1981	Germany	English
CH_3NH_2 + H_2O: LiBr (2:3)(W)	GS	-20-200	0.5-30 (2)	0-100	176	Radermacher	1981	Germany	English
CH_3NH_2 + H_2O: LiBr (2:3)(W)	GS	-30-300	0.5-30 (2)	0-100	178	Radermacher	1982	Germany	German

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.4.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
CH_3NH_2 + LiBr: H_2O	GS	20-60	NA	40-52	27	Bokelmann	1983	Germany	English
CH_3NH_2 + LiBr: H_2O	GS	20-60	NA	40-52	46	Ehmke	1983	Germany	English
CH_3NH_2 + NH_3: H_2O	GS	20-60	NA	30-55	27	Bokelmann	1983	Germany	English
CH_3NH_2 + NH_3: H_2O	GS	20-60	NA	30-55	46	Ehmke	1983	Germany	English
CH_3NH_2 + $LiNO_3$:H_2O	GS	20-60	NA	40-57	46	Ehmke	1983	Germany	English
CH_3NH_2 + $LiNO_3$:H_2O	GS	20-60	NA	40-57	27	Bokelmann	1983	Germany	English
CH_3NH_2 + $LiNO_3$:EG	GS	20-60	NA	30-40	27	Bokelmann	1983	Germany	English
CH_3NH_2 + $LiNO_3$:EG	GS	20-60	NA	30-40	46	Ehmke	1983	Germany	English

X - Liquid Phase
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(2) - mbar

c - ppm by weight of A in Vapor Phase
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Table A.4.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
CH_3NH_2 + LiSCN:EG (0.6:1)(W)	GE	100	0.69-10.0	24.7-59.6	19	Biermann	1978	U.S.A.	English
CH_3NH_2 + LiSCN: 1,4 BDL (0.8:1)(W)	GE	100	0.69-10.0	24.9-54.8	19	Biermann	1978	U.S.A.	English
CH_3NH_2 + LiSCN:MEA (0.6:1)(W)	GE	100	0.689-10.0	21.1-48.0	19	Biermann	1978	U.S.A.	English
CH_3NH_2 + LiSCN:DMF (0.7:1)(W)	GE	100	0.689-10.0	10.1-51.1	19	Biermann	1978	U.S.A.	English
CH_3NH_2 + LiSCN:DMETEG (2:1)(W)	GE	100	0.69-10.0	13.5-52.3	19	Biermann	1978	U.S.A.	English
CH_3NH_2 + LiSCN:DMETEG (0.6:1)(W)	GS	40-160	0.345-5.17	25.0-45.0	19	Biermann	1978	U.S.A.	English
$C_2H_5NH_2$ + H_2O	TGEP	2.55-152.44	28.7-15870 (1)	7.77-71.9	256	Uemura	1966	Japan	Japanese

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c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.4.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$C_2H_5NH_2 + H_2O$	GS	0-140	0.8-5	0-100	256	Uemura	1966	Japan	Japanese
$C_2H_5NH_2 + H_2O$	TS	0-140	10.1-12500 (1)	10-70	256	Uemura	1966	Japan	Japanese
$C_2H_5NH_2 + H_2O$	GS	NA	0.8-5	0-100 0-100	256	Uemura	1966	Japan	Japanese
$C_2H_5NH_2 + H_2O$	GP	0-160	20-20000 (1)	0-100	256	Uemura	1966	Japan	Japanese
Trimethylamine + TEG	GE	49	NA	5.1-55.0	190	Roberson	1966	U.S.A.	English
Dimethylamine + TEG	GE	49	NA	3.9-48.2	190	Roberson	1966	U.S.A.	English
A.4.2. Crystallization Temperature									
CH_3NH_2 + NaSCN	GE	-46-66	NA	50.0-53.5	194	Rush	1967	U.S.A.	English
A.4.4. Heat of Mixing									
$CH_3NH_2 + H_2O$	GE	10 & 30	NA	15-38	257	Uemura	1967	Japan	Japanese
$CH_3NH_2 + H_2O$	TE	10	NA	5-40	257	Uemura	1967	Japan	Japanese

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(2) - mbar

c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.4.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$CH_3NH_2 + H_2O$	GS	NA	NA	0-60	257	Uemura	1967	Japan	Japanese
$C_2H_5NH_2 + H_2O$	GTE	7 & 12.4	NA	1.1-70.3	73	Hasaba	1960	Japan	Japanese
CH_3NH_2 + LiSCN	PC	27-127	0.064-13.2	41.8-65.7	126	Macriss	1969	U.S.A.	English
A.4.5. Liquid-Phase Densities									
$CH_3NH_2 + H_2O$	GE	0-50	NA	10-40	257	Uemura	1967	Japan	Japanese
$CH_3NH_2 + H_2O$	GTS	0-50	NA	5-35	257	Uemura	1967	Japan	Japanese
CH_3NH_2 + LiSCN	TE	31-132	NA	41.8-65.7	126	Macriss	1970	U.S.A.	English
$CH_3NH_2 + H_2O$: LiBr (2:3)(W)	TGS	30-180	NA	0-100	177	Radermacher	1981	Germany	English
$CH_3NH_2 + H_2O$: LiBr (2:3)(W)	TS	30-180	NA	0-100	178	Radermacher	1982	Germany	German
$C_2H_5NH_2 + H_2O$	TEP	2-55	NA	8.1-68.4	73	Hasaba	1960	Japan	Japanese
$C_2H_5NH_2 + H_2O$	TS	0-60	NA	5-70	73	Hasaba	1960	Japan	Japanese
$C_2H_5NH_2 + H_2O$	TS	2, 7, 40	NA	0-100	73	Hasaba	1960	Japan	Japanese

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NA - Not Available

Table A.4.0. (Cont.)

A.4.6. Vapor-Liquid Phase Enthalpies

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$CH_3NH_2 + H_2O$	GS	-40-180	0.2-10	0-100	257	Uemura	1967	Japan	Japanese
$C_2H_5NH_2 + H_2O$	GS	-20-160	7-7600 (1)	0-100	256	Uemura	1966	Japan	Japanese
$CH_3NH_2 + H_2O$: LiBr (2:3)(W)	GS	-30-210	0.4-20 (2)	0-100	177	Radermacher	1981	Germany	English
$CH_3NH_2 + H_2O$: LiBr (2:3)(W)	GS	-30-210	0.4-20 (2)	0-100	178	Radermacher	1982	Germany	English

A.4.7. Specific Heat

$CH_3NH_2 + H_2O$	GS	NA	NA	0-100	257	Uemura	1967	Japan	Japanese
$CH_3NH_2 + H_2O$	TS	10-80	NA	10-90	257	Uemura	1967	Japan	Japanese
$CH_3NH_2 + H_2O$	GE	0-50	NA	5-30	257	Uemura	1967	Japan	Japanese
$CH_3NH_2 + H_2O$: LiBr (2:3)(W)	TGS GE	30-150	NA	0-100	177	Radermacher	1981	Germany	English
$CH_3NH_2 + H_2O$: LiBr (2:3)(W)	TS	30-150	NA	0-100	178	Radermacher	1982	Germany	German

X - Liquid Phase
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(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.4.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$CH_3NH_2 + H_2O$: LiBr (2:3)(W)	GS	30-200	NA	0-100	176	Radermacher	1981	Germany	English
$C_2H_5NH_2 + H_2O$	TEP	7-55	NA	8.1-68.4	73	Hasaba	1960	Japan	Japanese
$C_2H_5NH_2 + H_2O$	TS	10-55	NA	5-70	73	Hasaba	1960	Japan	Japanese
$C_2H_5NH_2 + H_2O$	GE	25 & 40	NA	8.1-68.4	73	Hasaba	1960	Japan	Japanese
A.4.9. Viscosity									
$CH_3NH_2 + H_2O$	GTS	0-50	NA	5-30	257	Uemura	1967	Japan	Japanese
CH_3NH_2 + LiSCN	TE	26-93	0.064-13.2	41.8-65.7	126	Macriss	1970	U.S.A.	English
$C_2H_5NH_2 + H_2O$	GTE	0-50	NA	7.966-70.25	75	Hasaba	1961	Japan	Japanese
$C_2H_5NH_2 + H_2O$	TS	0-50	NA	5-70	75	Hasaba	1961	Japan	Japanese
A.4.12. Thermal Conductivity									
$CH_3NH_2 + H_2O$	TEP	4.8-92	NA	3.1-39	257	Uemura	1967	Japan	Japanese
$CH_3NH_2 + H_2O$	GE	5-40	NA	10-35	257	Uemura	1967	Japan	Japanese

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A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.4.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
$CH_3NH_2 + H_2O$	TGS	5-40	NA	5-35	257	Uemura	1967	Japan	Japanese
$C_2H_5NH_2 + H_2O$	GTE	5-50	NA	9.074-48.970	251	Uemura	1963	Japan	Japanese
$C_2H_5NH_2 + H_2O$	GTS	5-60	NA	0-60	251	Uemura	1963	Japan	Japanese
A.4.15. Surface Tension									
$CH_3NH_2 + H_2O$	GE	5-50	NA	5-38	257	Uemura	1967	Japan	Japanese
$CH_3NH_2 + H_2O$	TGS	0-40	NA	5-35	257	Uemura	1967	Japan	Japanese
$C_2H_5NH_2 + H_2O$	TE	0-60	NA	8.43-58.86	75	Hasaba	1967	Japan	Japanese
$C_2H_5NH_2 + H_2O$	TGS	0-60	NA	5-60	75	Hasaba	1961	Japan	Japanese

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A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.5.0. SULFUR DIOXIDE BINARY AND MULTICOMPONENT ABSORPTION FLUIDS PROPERTIES DATA

A.5.1. Vapor-Liquid Equilibrium

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
SO_2 + DMETEG	TE	25-93	0.042-20.3	5.1-78.3	4	Albright	1963	U.S.A.	English
SO_2 + DMF	TE	25-93	0.096-18.7	16.1-83.4	4	Albright	1963	U.S.A.	English
SO_2 + DMA	TE	25-93	0.021-14.4	7.9-71.2	4	Albright	1963	U.S.A.	English
SO_2 + 2-Octanone	TE	25-93	1.14-19.4	23.2-74.5	4	Albright	1963	U.S.A.	English
SO_2 + Ethyl laurate	TE	25-93	1.45-19.6	16.8-61.3	4	Albright	1963	U.S.A.	English
SO_2 + Nitro-benzene	TE	25-93	1.32-19.9	21.2-73.7	4	Albright	1963	U.S.A.	English
SO_2 + n-Heptyl alcohol	TE	25-93	2.04-20.1	22.3-73.1	4	Albright	1963	U.S.A.	English
A.5.4. Heat of Mixing									
SO_2 + DMETEG	GSC	25-95	NA	0.0-100.0	4	Albright	1963	U.S.A.	English
SO_2 + DMF	GSC	25-95	NA	0.0-100.0	4	Albright	1963	U.S.A.	English
SO_2 + DMA	GSC	25-95	NA	0.0-100.0	4	Albright	1963	U.S.A.	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.6.0. REFRIGERANT 22 BINARY AND MULTICOMPONENT ABSORPTION FLUIDS PROPERTIES DATA

A.6.1. Vapor-Liquid Equilibrium

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R22 + DMETEG	GTEP	20-90	0.08-7.65	0-23.64	220	Suzuki	1973	Japan	Japanese
R22 + DMETEG	TGS	-20-200	0.5-25	10-100	47	Ehmke	1984	Germany	German
R22 + DMETEG	TEP	0-200	0.5-25	10-100	47	Ehmke	1984	Germany	German
R22 + DMETEG	GC	10-150	6.34 & 17.91	10-90	159	Oouchi	1985	Japan	Japanese
R22 + DMETEG	GS	30-100	2-22	30-50	159	Oouchi	1985	Japan	Japanese
R22 + DMETEG	GC	NA	0-50	0-100	146	Morel	1983	France	French
R22 + DMETEG	TE	24-135	0.965-20.5	8.4-79.9	35	Buclez	1959	U.S.A.	English
R22 + DMETEG	TE	38-107	0.276-1.38	3.1-3.9	3	Albright	1962	U.S.A.	English
R22 + DMETEG	GS	28-177	0.345-21.5	6.7-63.2	132	Mastrangelo	1959	U.S.A.	English
R22 + DMETEG	GS	28-86	0-9.31	0.0-100.0	216	Sims	1972	U.S.A.	English
R22 + DMETEG	GS	-40-180	0.63-40.0	0.0-100.0	116	Latyshev	1969	U.S.S.R.	Russian
R22 + DMETEG	CTS	24-121	0-31.9	0.0-100.0	124	Macriss	1964	U.S.A.	English

X - Liquid Phase
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A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.6.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R22 + DMETEG	GE	-110 - -30	NA	10.0-90.0	113	Kriebel	1965	Germany	German
R22 + DMETEG	GE	0-120	1	0-23.64	220	Suzuki	1973	Japan	Japanese
R22 + DMETEG	GE	20-70	1.0	10-30	27	Bokelmann	1983	Germany	English
R22 + DMETEG	GS	0-150	1.0	0-100	181	Renz	1978	Germany	German
R22 + DMETrEG	TEP	-20-200	0.5-25	10-100	47	Ehmke	1984	Germany	German
R22 + DMETrEG	GS	-20-200	0.5-20	0-100	26	Bokelmann	1983	Germany	English
R22 + DMETrEG	GS	-20-200	0.5-25	10-100	32	Bokelmann	1985	Germany	English
R22 + DMEDEG	TE	0-30	0.069-1.03	5.6-24.9	173	Podoll	1982	U.S.A.	English
R22 + DMEDEG	GEP GS	-20-200	0.1-50	14-100	8	Ando	1983	Japan	Japanese
R22 + DMEDEG	GS	-20-200	0-30	10-100	8	Ando	1983	Japan	Japanese
R22 + DMEDEG	GEP GS	-20-200	0.1-50	14-100	7	Ando	1983	Japan	Japanese
R22 + DMEDEG	GS	-20-200	0-30	10-100	7	Ando	1983	Japan	Japanese

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(2) - mbar
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Table A.6.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R22 + DMEDEG	GEP	-20-200	0.1-50	20-100	9	Ando	1983	Japan	Japanese
R22 + DMEDEG	GS	-20-200	0-30	10-100	9	Ando	1983	Japan	Japanese
R22 + METrPG	GS	20-30	0-9.31	0.0-100.0	216	Sims	1972	U.S.A.	English
R22 + IBA	GS	-70-200	0.016-20	0-100	215	Sellerio	1966	Italy	German
R22 + IBA	P	NA	NA	NA	250	Uemura	1968	Japan	Japanese
R22 + IBA	GS	0-120	0-40,000 (1)	0-100	250	Uemura	1968	Japan	Japanese
R22 + DMF	GTEP	16.15-48.95	179-743 (1)	7.25-27.05	250	Uemura	1968	Japan	Japanese
R22 + DMF	GS GP	0-120	0-40,000 (1)	0-100	250	Uemura	1968	Japan	Japanese
R22 + DMF	P	NA	NA	1-100	10	Ando	1982	Japan	Japanese
R22 + DMF	GS	-50-200	0.1-30	0-100	10	Ando	1982	Japan	Japanese
R22 + DMF	TE	38-121	1.38-19.9	20.8-67.7	222	Thieme	1961	U.S.A.	English
R22 + DMF	TE	38-104	0.483-2.00	7.8-9.0	3	Albright	1962	U.S.A.	English

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(2) - mbar
c - ppm by weight of A in Vapor Phase
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Table A.6.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R22 + DMF	GTE	20-60	755-765 (1)	8.5-17.6	212	Seliverstov	1970	U.S.S.R.	English
R22 + DMF	TE	-20-50	740 (1)	12.9-46.8	130	Makitra	1979	U.S.S.R.	Russian
R22 + DMF	GE	20-70	1.0	10-30	27	Bokelmann	1983	Germany	English
R22 + DEF	TE	38-104	1.79-17.1	25.8-75.7	222	Thieme	1961	U.S.A.	English
R22 + DMA	TE	0-30	0.103-1.10	9.4-34.1	173	Podoll	1982	U.S.A.	English
R22 + DMA	TE	20-101	0.621-19.7	25.1-73.4	3	Albright	1962	U.S.A.	English
R22 + DMH	TE	0-30	0.103-1.03	7.2-23.7	173	Podoll	1982	U.S.A.	English
R22 + DMH	GS	0-150	-30-70[a]	22.9-50.7	18	Biermann	1978	U.S.A.	English
R22 + TMM	GS	0-150	-30-70[a]	25.0-55.0	18	Biermann	1978	U.S.A.	English
R22 + Dimethyl phthalate	TGEP	20-60	754-765 (1)	5.4-13.8	202	Seliverstov	1964	U.S.S.R.	English
R22 + Diethyl phthalate	TGEP	20-60	754-765 (1)	7.8-17.2	202	Seliverstov	1964	U.S.S.R.	English

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Table A.6.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R22 + Dibutyl phthalate (DBP)	TGEP	20-60	754-765 (1)	9.0-21.1	202	Seliverstov	1964	U.S.S.R.	English
R22 + DBP	GSP	0-100	0-50	0.0-100.0	118	Latyshev	1968	U.S.S.R.	Russian
R22 + DBP	GE	25-75	0-20	0.1-0.8 (4)	204	Seliverstov	1965	U.S.S.R.	English
R22 + DBP	GS	-40-180	0.63-40.0	0.0-100.0	116	Latyshev	1969	U.S.S.R.	Russian
R22 + DBP	TE	20-75	1.0-19.7	7.1-64.7	205	Seliverstov	1965	U.S.S.R.	Russian
R22 + Dioctyl-phthalate (DOP)	GS	20-30	0-9.31	0.0-100.0	216	Sims	1972	U.S.A.	English
R22 + DOP	GTE	20-60	755-765 (1)	3.5-6.8	212	Seliverstov	1970	U.S.S.R.	English
R22 + DDP	GTE	20-60	755-765 (1)	2.45-5.4	212	Seliverstov	1970	U.S.S.R.	English
R22 + DCP	GTE	20-60	755-765 (1)	3.0-6.5	212	Seliverstov	1970	U.S.S.R.	English
R22 + DMMP	TEP	0-125	0-49	0-100	268	Yaron	1985	Israel	English
R22 + DMMP	GP	0-150	0-30	0-100	268	Yaron	1985	Israel	English
R22 + DMSO	GC	25-80	0-30	0-100	146	Morel	1983	France	French

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg

R - Refrigerant
A - Absorbent(s)
(2) - mbar

c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.6.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R22 + DMSO	TEC	25-80	0.94-27.48	17-100	146	Morel	1983	France	French
R22 + TMS	GS	0-150	NA	50.0-74.0	18	Biermann	1978	U.S.A.	English
R22 + Pentane-dione	TE	24-121	1.31-21.5	14.9-76.1	35	Buclez	1959	U.S.A.	English
R22 + Aceto-phenone	TE	24-107	1.86-17.3	14.0-62.1	35	Buclez	1959	U.S.A.	English
R22 + Benz-aldehyde	TE	24-93	2.34-20.6	16.8-46.1	35	Buclez	1959	U.S.A.	English
R22 + Valeric acid	TE	24-93	2.34-19.0	14.1-62.3	35	Buclez	1959	U.S.A.	English
R22 + Linoleic acid	TE	24-107	2.41-7.65	6.0-18.7	35	Buclez	1959	U.S.A.	English
R22 + (TAN)	TE	24-121	1.72-21.0	9.2-53.8	172	Pluche	1959	U.S.A.	English
R22 + TAN	GE	24-121	1.7-21.0	9.2-53.8	2	Albright	1960	U.S.A.	English
R22 + TAN	GTE	20-60	755-765 (1)	3.4-6.6	212	Seliverstov	1970	U.S.S.R.	English

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(1) - mmHg
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A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.6.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R22 + Diethyl-oxalate	TE	24-121	1.52-21.6	13.1-63.5	172	Pluche	1959	U.S.A.	English
R22 + Diethyl-malonate	TE	24-121	1.24-21.5	17.3-66.1	172	Pluche	1959	U.S.A.	English
R22 + Ethyl benzoate	TE	24-93	2.21-20.3	13.9-63.5	172	Pluche	1959	U.S.A.	English
R22 + Dibutyl sebacate (DBS)	TGEP	20-60	754-765 (1)	12.0-26.2	202	Seliverstov	1964	U.S.S.R.	English
R22 + DBS	GS	22-83	0.0-32.0	0.0-100.0	206	Seliverstov	1965	U.S.S.R.	Russian
R22 + DBS	TE	22-83	1.0-20.4	3.3-56.5	206	Seliverstov	1965	U.S.S.R.	Russian
R22 + Dioctyl-sebacate (DOS)	GS	20-30	0-9.31	0.0-100.0	216	Sims	1972	U.S.A.	English
R22 + DOS	GTE	20-60	755-765 (1)	4.1-7.6	212	Seliverstov	1970	U.S.S.R.	English
R22 + Dibutyl-carbitol	GS	20-30	0-9.31	0.0-100.0	216	Sims	1972	U.S.A.	English
R22 + NMP	GS	0-150	NA	19.0-57.0	18	Biermann	1978	U.S.A.	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.6.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R22 + NMP	GE	20-70	1.0	10-30	27	Bokelmann	1983	Germany	English
R22 + Dicumyl-methane	TGEP	20-60	754-765 (1)	5.2-11.8	202	Seliverstov	1964	U.S.S.R.	English
R22 + Oleic acid	TGEP	20-60	754-765 (1)	7.7-12.6	202	Seliverstov	1964	U.S.S.R.	English
R22 + Methyl benzoate	TGEP	20-60	754-765 (1)	5.2-11.8	202	Seliverstov	1964	U.S.S.R.	English
R22 + Propyl benzoate	TGEP	20-60	754-765 (1)	5.5-14.0	202	Seliverstov	1964	U.S.S.R.	English
R22 + Butyl benzoate	TGEP	20-60	754-765 (1)	6.4-15.3	202	Seliverstov	1964	U.S.S.R.	English
R22 + Benzyl acetate	TGEP	20-60	754-765 (1)	5.4-13.2	202	Seliverstov	1964	U.S.S.R.	English
R22 + Methyl salicylate	TGEP	20-60	754-765 (1)	4.0-8.0	202	Seliverstov	1964	U.S.S.R.	English
R22 + HMPT	GE	20-70	1.0	10-30	27	Bokelmann	1983	Germany	English

X - Liquid Phase
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(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.6.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R22 + ETFE	GE	20-70	1.0	10-30	27	Bokelmann	1983	Germany	English
R22 + DBP:DMF	GS	20 & 80	0.5-15.0	10-50	213	Seliverstov	1970	U.S.S.R.	Russian
R22 + DBP:DMF	TE	20-60	NA	2.8-13.5	211	Seliverstov	1970	U.S.S.R.	Russian
R22 + DBP:DMF	TE	20-80	1.8-16.3	12.9-47.1	211	Seliverstov	1971	U.S.S.R.	Russian
R22 + DMETEG: Benzyl alcohol (1:1)(M)	TE	38-121	2.13-36.1	14.4-63.5	81	Hesselberth	1965	U.S.A.	English

A.6.3. Corrosion

Fluid System	Data Type	Temp. Range, °C	Corrosion Inhibitor, wt %	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R22 + DMETEG	TE	121	NA	50.0 (Volume)	49	Eiseman	1959	U.S.A.	English
R22 + DMETEG	TE	180	TNP - 0.5 EP - 0.5 BO - 0.5 EPC - 0.5 AGE - 0.5	NA	159	Oouchi	1985	Japan	Japanese

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(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.6.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Corrosion Inhibitor, wt %	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
			DEO - 0.5 BGE - 0.5 PGE - 0.5 EPM - 0.5 CPE - 0.5 DEC - 0.5						
R22 + DMETEG	TE	180	None	NA	159	Oouchi	1985	Japan	Japanese
R22 + DMETEG	E	130	None	10.0	67	Griess	1985	U.S.A.	English
R22 + DBP	TE	NA	NA	NA	204	Seliverstov	1965	U.S.S.R.	English

A.6.4. Heat of Mixing

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R22 + DMETEG	TE	20.21-24.66	NA	16.1-78.7	115	Latyshev	1969	U.S.S.R.	Russian
R22 + DMETEG	GSC	25-95	NA	0.0-100.0	3	Albright	1962	U.S.A.	English
R22 + DMETEG	TEG	24	NA	0.0-100.0	124	Macriss	1964	U.S.A.	English

X - Liquid Phase
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(1) - mmHg

R - Refrigerant
A - Absorbent(s)
(2) - mbar

c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.6.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R22 + DMETEG	C	NA	NA	NA	226	Tyagi	1976	Japan	English
R22 + DMEDEG	TEC	25	NA	5.0-8.7	173	Podoll	1982	U.S.A.	English
R22 + DMEDEG	GE	NA	NA	0-100	9	Ando	1983	Japan	Japanese
R22 + DBP	TC	30	NA	30.0-100.0	203	Seliverstov	1964	U.S.S.R.	English
R22 + DBP	TC	NA	NA	0.1-0.7	204	Seliverstov	1965	U.S.S.R.	English
R22 + DBP	GS	20-70	2-14	0-50	207	Seliverstov	1966	U.S.S.R.	Russian
R22 + DBP	TE	22.95-25.77	NA	13.7-100	115	Latyshev	1969	U.S.S.R.	Russian
R22 + DBP	GS	20-60	NA	0-100	209	Seliverstov	1968	U.S.S.R.	English
R22 + DBP	TC	20-70	NA	10-90	209	Seliverstov	1968	U.S.S.R.	English
R22 + IBA	GE	NA	NA	0-60	250	Uemura	1968	Japan	Japanese
R22 + DMF	GE	NA	NA	0-70	250	Uemura	1968	Japan	Japanese
R22 + DMF	TC	NA	NA	NA	212	Seliverstov	1970	U.S.S.R.	English
R22 + DMF	TE	-20-50	740 (1)	12.9-46.8	130	Makitra	1979	U.S.S.R.	English

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A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.6.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R22 + DMF	C	NA	NA	NA	226	Tyagi	1976	Japan	English
R22 + DMA	C	NA	NA	NA	226	Tyagi	1976	Japan	English
R22 + DEF	C	NA	NA	NA	226	Tyagi	1976	Japan	English
R22 + DBS	GTC	22-82	NA	10-90	210	Seliverstov	1968	U.S.S.R.	English
R22 + DBS	TE	22-82	NA	0-100	210	Seliverstov	1968	U.S.S.R.	English
R22 + DBS	GS	22-82	NA	0-100	210	Seliverstov	1968	U.S.S.R.	English
R22 + DDP	TC	NA	NA	NA	212	Seliverstov	1970	U.S.S.R.	English
R22 + DCP	TC	NA	NA	NA	212	Seliverstov	1970	U.S.S.R.	English
R22 + DOP	TC	NA	NA	NA	212	Seliverstov	1970	U.S.S.R.	English
R22 + DOS	TC	NA	NA	NA	212	Seliverstov	1970	U.S.S.R.	English
R22 + TAN	TC	NA	NA	NA	212	Seliverstov	1970	U.S.S.R.	English
A.6.5. Liquid-Phase Densities									
R22 + DMETEG	TGE	20-90	NA	0-23.64	220	Suzuki	1973	Japan	Japanese

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(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.6.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R22 + DMETEG	TGS	-70-80	NA	0.0-100.0	113	Kriebel	1965	Germany	German
R22 + DMETrEG	GS	20-200	0-25	0-100	47	Ehmke	1984	Germany	German
R22 + DMETrEG	TEP	20-90	0-25	0-100	47	Ehmke	1984	Germany	German
R22 + IBA	GTE	10-80	NA	0-22.55	250	Uemura	1968	Japan	Japanese
R22 + IBA	TS	10-80	NA	0-25	250	Uemura	1968	Japan	Japanese
R22 + DMF	GTE	5-50	NA	0-29.4	260	Uemura	1967	Japan	Japanese
R22 + DMF	GTS	5-50	NA	0-30	260	Uemura	1967	Japan	Japanese
A.6.6. Vapor-Liquid-Phase Enthalpies									
R22 + DMETEG	GS	0-200	0.5-20	0-100	114	Latyshev	1968	U.S.S.R.	Russian
R22 + DMETEG	GS	-90-70	0.1-20	0-100	113	Kriebel	1965	Germany	German
R22 + DMETEG	TES	24-121	1.38-47.3	0.0-100.0	124	Macriss	1964	U.S.A.	English
R22 + DMETEG	GS	0-200	0.5-20	0-100	117	Latyshev	1969	U.S.S.R.	Russian
R22 + DMETrEG	GS	0-200	0.5-25	0-100	31	Bokelmann	1985	Germany	English

X - Liquid Phase
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(1) - mmHg
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A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.6.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R22 + DMEDEG	GP	-40-180	0.1-50	0-100	8	Ando	1983	Japan	Japanese
R22 + DMEDEG	GP	-20-180	0.1-50	0-100	7	Ando	1983	Japan	Japanese
R22 + DMEDEG	GP	-20-200	0.1-50	0-100	9	Ando	1983	Japan	Japanese
R22 + DMEDEG	P	NA	NA	NA	135	Matshushita	1985	Japan	English
R22 + IBA	GS	-15-100	0.2-30	0-100	250	Uemura	1968	Japan	Japanese
R22 + DBP	GS	0-200	0.5-20	0-100	117	Latyshev	1969	U.S.S.R.	Russian
R22 + DBP	GTS	20-80	2-14	0-50	207	Seliverstov	1966	U.S.S.R.	Russian
R22 + DMMP	GP	0-150	0-30	0-100	268	Yaron	1985	Israel	English
R22 + DBS	GS	20-80	1-13	0-50	208	Seliverstov	1968	U.S.S.R.	Russian
R22 + DMF	GS	-15-100	0.5-25	0-100	250	Uemura	1968	Japan	Japanese
R22 + DMF	P	NA	NA	NA	135	Matshushita	1985	Japan	English
A.6.7. Specific Heat									
R22 + DMETEG	GSE	20-180	NA	23.39	159	Oouchi	1985	Japan	Japanese

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(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.6.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R22 + DMETEG	TE	66-177	NA	8.9-53.9	124	Macriss	1964	U.S.A.	English
R22 + DMETEG	GE	0-50	NA	NA	115	Latyshev	1969	U.S.S.R.	Russian
R22 + DMEDEG	TE	0-25	NA	10.0-20.0	173	Podoll	1982	U.S.A.	English
R22 + DMEDEG	GEP GS	-40-180	NA	0-100	8	Ando	1983	Japan	Japanese
R22 + DMEDEG	GEP	-40-180	NA	0-100	9	Ando	1983	Japan	Japanese
R22 + DMEDEG	GEP GS	-40-180	NA	0-100	7	Ando	1983	Japan	Japanese
R22 + IBA	TEP	10-80	NA	0-14.45	250	Uemura	1968	Japan	Japanese
R22 + IBA	GTS	0-100	NA	0-100	250	Uemura	1968	Japan	Japanese
R22 + DMMP	P	NA	NA	NA	268	Yaron	1985	Israel	English
R22 + DMF	TEP	10-70	NA	0-27.5	250	Uemura	1968	Japan	Japanese
R22 + DMF	GTS	0-100	NA	0-100	250	Uemura	1968	Japan	Japanese
R22 + DMA	TE	0-25	NA	10.0-20.0	173	Podoll	1982	U.S.A.	English

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(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.6.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R22 + DMH	TE	0-25	NA	10.0-20.0	173	Podoll	1982	U.S.A.	English
R22 + DBP	GE	0-50	NA	NA	115	Latyshev	1969	U.S.S.R.	Russian
A.6.8. Stability									
R22 + DMEDEG	GE	100-240	NA	NA	8	Ando	1983	Japan	Japanese
R22 + DMETEG	GE	100-240	NA	NA	8	Ando	1983	Japan	Japanese
R22 + DMETEG	TE	250-350	NA	5.0 (Volume)	49	Eiseman	1959	U.S.A.	English
R22 + DMETEG	TE	NA	NA	NA	28	Bokelmann	1983	Germany	English
R22 + DMF	GE	100-240	NA	NA	8	Ando	1983	Japan	Japanese
R22 + DMA	GE	100-240	NA	NA	8	Ando	1983	Japan	Japanese
A.6.9. Viscosity									
R22 + DMETEG	TGEP	20-90	NA	0-23.64	220	Suzuki	1973	Japan	Japanese
R22 + DMETEG	GS	20-90	NA	0-80	60	Fukuda	1983	Japan	Japanese
R22 + DMETrEG	TEP	20-50	NA	0-50	47	Ehmke	1984	Germany	German

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A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.6.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R22 + DMETrEG	GS	20-90	NA	0-50	47	Ehmke	1984	Germany	German
R22 + IBA	GTE	10-70	NA	0-22.65	250	Uemura	1968	Japan	Japanes
R22 + IBA	TS	10-70	NA	0-25	250	Uemura	1968	Japan	Japanes
R22 + DMF	GTE	5-50	NA	0-33	260	Uemura	1967	Japan	Japanes
R22 + DMF	GTS	5-50	NA	0-30	260	Uemura	1967	Japan	Japanes
A.6.11. Heat Transfer Rate									
R22 + DMETEG	GE	6-100	NA	NA	160	Oouchi	1983	Japan	Japanes
A.6.13. Refractive Index									
R22 + DMETEG	TGE	25-60	NA	0-23.64	220	Suzuki	1973	Japan	Japanes
R22 + IBA	TGE	20	NA	0-31.25	250	Uemura	1968	Japan	Japanes
R22 + DMF	TGE	20	NA	0-38.45	260	Uemura	1967	Japan	Japanes
A.6.14. Entropy									
R22 + DBS	TE	22-82	NA	10-90	210	Seliverstov	1968	U.S.S.R.	English

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A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.6.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R22 + DBS	GS	42.5-82	NA	0-100	210	Seliverstov	1968	U.S.S.R.	English
A.6.15. Surface Tension									
R22 + DMF	GTE	5-50	NA	0-31.9	260	Uemura	1967	Japan	Japanese
R22 + DMF	GTS	5-50	NA	0-30	260	Uemura	1967	Japan	Japanese
R22 + IBA	GTE	30	NA	0-15.9	250	Uemura	1968	Japan	Japanese

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(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.7.0. REFRIGERANT 21 BINARY AND MULTICOMPONENT ABSORPTION FLUIDS PROPERTIES DATA

A.7.1. Vapor-Liquid Equilibrium

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R21 + DMETEG	P	NA	NA	NA	267	Yaron	1985	Israel	English
R21 + DMETEG	GP	0-150	0-66	0-100	267	Yaron	1985	Israel	English
R21 + DMETEG	TE	25-121	0.138-5.10	17.7-69.6	35	Buclez	1959	U.S.A.	English
R21 + DMETEG	TE	38-107	0.069-0.896	7.7-9.5	3	Albright	1962	U.S.A.	English
R21 + DMETEG	TE	27-89	0.048-1.52	7.2-71.0	132	Mastrangelo	1959	U.S.A.	English
R21 + DMETEG	GS	29-118	0.483-2.21	16.7-52.4	275	Zellhoeffer	1937	U.S.A.	English
R21 + DMETEG	PC	-13-137	0.5-5.5	10.0-100.0	143	Mohantz	1985	France	French
R21 + DMETrEG	TE	20-101	0.152-6.48	16.2-77.9	3	Albright	1962	U.S.A.	English
R21 + DMEDEG	TE	0-30	0.0097-0.228	8.2-30.1	173	Podoll	1982	U.S.A.	English
R21 + DMF	TE	38-121	0.303-5.58	31.6-83.7	222	Thieme	1961	U.S.A.	English
R21 + DMF	TE	38-107	0.110-1.17	13.7-17.1	3	Albright	1962	U.S.A.	English
R21 + DMF	GE	NA	NA	0-40	242	Uemura	1973	Japan	Japanese

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.7.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R21 + DMF	P	NA	NA	NA	242	Uemura	1973	Japan	Japanese
R21 + DMF	PC	NA	NA	NA	12	Badarinara-yana	1982	England	English
R21 + DEF	TE	38-121	0.896-7.03	28.1-74.1	222	Thieme	1961	U.S.A.	English
R21 + DMA	TE	0-30	0.011-0.221	12.5-38.8	173	Podoll	1982	U.S.A.	English
R21 + DMH	TE	0-30	0.0067-0.221	6.6-30.1	173	Podoll	1982	U.S.A.	English
R21 + DMH	GS	0-150	0.165-20.8	23.0-55.0	18	Biermann	1978	U.S.A.	English
R21 + NMP	GS	0-150	NA	25.0-51.0	18	Biermann	1978	U.S.A.	English
R21 + Diethyl-oxalate	TE	24-121	0.276-7.24	22.0-68.5	172	Pluche	1959	U.S.A.	English
R21 + Diethyl-malonate	TE	24-121	0.414-7.03	30.0-66.3	172	Pluche	1959	U.S.A.	English
R21 + Diethyl-adipate	TE	24-121	0.276-7.10	23.2-60.7	172	Pluche	1959	U.S.A.	English
R21 + Diethyl-adipate	GE	24-121	0.27-7.0	23.0-61.0	2	Albright	1960	U.S.A.	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.7.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R21 + Ethyl-benzoate	TE	24-121	0.483-7.51	31.2-66.3	172	Pluche	1959	U.S.A.	English
R21 + n-Butyl-benzoate	TE	24-121	0.552-7.10	29.9-64.1	172	Pluche	1959	U.S.A.	English
R21 + Tri-acetin	TE	24-121	0.276-8.14	18.0-63.1	172	Pluche	1959	U.S.A.	English
R21 + n-Heptyl alcohol	TE	38-93	0.965-5.93	37.5-71.9	172	Pluche	1959	U.S.A.	English
R21 + 2-Octanone	TE	24-121	0.276-7.24	25.1-70.0	35	Buclez	1959	U.S.A.	English
R21 + Pentane-dione	TE	24-121	0.276-7.45	23.9-73.7	35	Buclez	1959	U.S.A.	English
R21 + Oleic acid	TE	24-107	0.414-7.58	10.8-47.1	35	Buclez	1959	U.S.A.	English
R21 + Linoleic acid	TE	24-121	0.483-6.07	12.6-49.9	35	Buclez	1959	U.S.A.	English
R21 + Valeric acid	TE	24-107	0.896-7.03	43.4-45.6	35	Buclez	1959	U.S.A.	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.7.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R21 + Aceto-phenone	TE	24-121	0.276-7.58	18.5-71.7	35	Buclez	1959	U.S.A.	English
R21 + Benzal-dehyde	TE	24-121	0.276-7.79	17.7-75.1	35	Buclez	1959	U.S.A.	English
R21 + Ethyl-laurate	TE	38-107	0.290-1.60	11.2-24.0	3	Albright	1962	U.S.A.	English
R21 + Diethyl-oxalate	TE	38-107	0.234-1.48	12.8-13.4	3	Albright	1962	U.S.A.	English
R21 + Diethyl-adipate	TE	38-107	0.248-1.55	13.0-13.8	3	Albright	1962	U.S.A.	English
R21 + Nitro-benzene	GE	52	1.03-3.10	17.3-77.0	222	Thieme	1961	U.S.A.	English
R21 + Aniline	GE	52	1.24-3.10	21.6-81.6	222	Thieme	1961	U.S.A.	English
R21 + Dimethyl aniline	GE	52	1.24-3.45	17.5-77.3	222	Thieme	1961	U.S.A.	English
R21 + M-Chloro aniline	GE	52	2.07-3.45	16.8-76.3	222	Thieme	1961	U.S.A.	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.7.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R21 + Octyl cyanide	GE	79	1.38-5.52	15.6-74.7	222	Thieme	1961	U.S.A.	English
R21 + N-Methyl-morpholine	GE	79	1.38-5.52	20.3-80.3	222	Thieme	1961	U.S.A.	English
R21 + Octyl amine	GE	79	1.38-5.52	16.6-76.1	222	Thieme	1961	U.S.A.	English
R21 + DMETEG: DMF (1.3:1 - 12.1:1)(M)	GE	38-107	0.689-5.52	34.8-46.6	222	Thieme	1961	U.S.A.	English
R21 + 65 Organics	TE	0	1	NA	272	Zellhoefer	272	U.S.A.	English
R21 + 96 Organics	TE	0	1	NA	273	Zellhoefer	273	U.S.A.	English

A.7.3. Corrosion Characteristics

Fluid System	Data Type	Temp. Range, °C	Corrosion Inhibitor	Wt. % x (1)	Reference No.	Author	Year	Country	Text
R21 + DMETEG	TE	121	NA	50.0 (Volume)	49	Eiseman	1959	U.S.A.	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg

R - Refrigerant
A - Absorbent(s)
(2) - mbar

c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.7.0. (Cont.)

A.7.4. Heat of Mixing

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R21 + DMETEG	GE	3	NA	4.9-89.8	274	Zellhoeffer	1938	U.S.A.	English
R21 + DMETEG	C	NA	NA	NA	226	Tyagi	1976	Japan	English
R21 + DMETrEG	C	NA	NA	NA	226	Tyagi	1976	Japan	English
R21 + DMEDEG	TEC	25	NA	10.7-29.0	173	Podoll	1982	U.S.A.	English
R21 + DMF	GS	10	NA	0-100	242	Uemura	1973	Japan	Japanese
R21 + DMF	P	NA	NA	NA	12	Badarinara-yana	1982	England	English
R21 + DMH	TEC	25	NA	12.8-33.9	173	Podoll	1982	U.S.A.	English
R21 + DMA	TE	25	NA	10.1-19.0	173	Podoll	1982	U.S.A.	English
R21 + ETL	C	NA	NA	NA	226	Tyagi	1976	Japan	English
R21 + DEO	C	NA	NA	NA	226	Tyagi	1976	Japan	English
R21 + DEA	C	NA	NA	NA	226	Tyagi	1976	Japan	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.7.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R21 + DEF	C	NA	NA	NA	226	Tyagi	1976	Japan	English
A.7.5. Liquid-Phase Densities									
R21 + DMF	GTE	5-80	NA	0-81.7	260	Uemura	1967	Japan	Japanese
R21 + DMF	GTS	5-80	NA	0-80	260	Uemura	1967	Japan	Japanese
A.7.6. Vapor-Liquid-Phase Enthalpies									
R21 + DMETEG	P	NA	NA	NA	267	Yaron	1985	Israel	English
R21 + DMETEG	GP	0-150	1-26	0-100	267	Yaron	1985	Israel	English
R21 + DMF	GP	-10-120	0.01-12	0-80	12	Badarinara-yana	1982	England	English
A.7.7. Specific Heat									
R21 + DMF	P	NA	NA	NA	242	Uemura	1973	Japan	Japanese
R21 + DMEDEG	TE	0-25	NA	10.0-50.0	173	Podoll	1982	U.S.A.	English
R21 + DMA	TE	0-25	NA	10.0-50.0	173	Podoll	1982	U.S.A.	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.7.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R21 + DMH	TE	0-25	NA	10.0-50.0	173	Podoll	1982	U.S.A.	English
A.7.8. Stability									
R21 + DMETEG	TE	250	NA	50.0 (Volume)	49	Eiseman	1959	U.S.A.	English
A.7.9. Viscosity									
R21 + DMF	GTE	5-50	NA	0-79	260	Uemura	1967	Japan	Japanese
R21 + DMF	GTS	5-50	NA	0-80	260	Uemura	1967	Japan	Japanese
A.7.13. Refractive Index									
R21 + DMF	GTE	20	NA	0-74.61	260	Uemura	1967	Japan	Japanese
A.7.15. Surface Tension									
R21 + DMF	GTE	5-50	NA	0-72.7	260	Uemura	1967	Japan	Japanese
R21 + DMF	GTS	5-50	NA	0-70	260	Uemura	1967	Japan	Japanese

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.8.0. REFRIGERANT 152 BINARY AND MULTICOMPONENT ABSORPTION FLUIDS PROPERTIES DATA

A.8.1. Vapor-Liquid Equilibrium

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R152 + DMF	TE	9.85-67.92	230.45-1907 (1)	4.85-16.45	221	Tange	1974	Japan	Japanese
R152 + DMF	GEP	10-90	200-5000 (1)	4.8-15	221	Tange	1974	Japan	Japanese
R152 + DMF	GP	0-100	100-40,000 (1)	5-30	221	Tange	1974	Japan	Japanese
R152 + DMF	GEP	10-70	150-3000 (1)	4.8-15	231	Uemura	1973	Japan	Japanese
A.8.4. Heat of Mixing									
R152 + DMF	GE	NA	NA	10-25	231	Uemura	1973	Japan	Japanese
R152 + DMF	GE	NA	NA	15-25	221	Tange	1974	Japan	Japanese
A.8.5. Liquid-Phase Densities									
R152 + DMF	GE TS	10-60	NA	0-20	221	Tange	1974	Japan	Japanese
R152 + DMF	GS	10-60	NA	0-20	231	Uemura	1973	Japan	Japanese

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg

R - Refrigerant
A - Absorbent(s)
(2) - mbar

c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.8.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
A.8.7. Specific Heat									
R152 + DMF	TEP	5-40	NA	0-13.45	221	Tange	1974	Japan	Japanese
R152 + DMF	GS	0-50	NA	0-20	231	Uemura	1973	Japan	Japanese
R152 + DMF	P	NA	NA	NA	231	Uemura	1973	Japan	Japanese
A.8.9. Viscosity									
R152 + DMF	GE TS	10-60	NA	0-20	221	Tange	1974	Japan	Japanese
R152 + DMF	GEC	NA	10-2000 (1)	5-20	221	Tange	1974	Japan	Japanese
R152 + DMF	GS	10-60	NA	0-20	231	Uemura	1973	Japan	Japanese
A.8.13. Refractive Index									
R152 + DMF	GTE	20	NA	0-25	221	Tange	1974	Japan	Japanese
R152 + DMF	GE	20	NA	0-35	221	Tange	1974	Japan	Japanese

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.8.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R152 + DMF	TS	20	NA	0-25	221	Tange	1974	Japan	Japanese
R152 + DMF	GE	20	NA	0-35	231	Uemura	1973	Japan	Japanese

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg

R - Refrigerant
A - Absorbent(s)
(2) - mbar

c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.9.0. REFRIGERANT 12 BINARY AND MULTICOMPONENT ABSORPTION FLUIDS PROPERTIES DATA

A.9.1. Vapor-Liquid Equilibrium

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R12 + DMETEG	TE	38-121	3.52-41.6	11.1-78.0	81	Hesselberth	1965	U.S.A.	English
R12 + DMA	TE	38-121	4.90-36.8	23.1-84.5	81	Hesselberth	1965	U.S.A.	English
R12 + DMF	TE	-20-50	740 (1)	1.8-16.4	130	Makitra	1979	U.S.S.R.	English
R12 + Dicumyl methane	GTEP	20-60	754-765 (1)	4.2-8.8	202	Seliverstov	1964	U.S.S.R.	English
R12 + Oleic acid	GTEP	20-60	754-765 (1)	2.4-10.9	202	Seliverstov	1964	U.S.S.R.	English
R12 + Methyl benzoate	GTEP	20-60	754-765 (1)	2.05-5.4	202	Seliverstov	1964	U.S.S.R.	English
R12 + Propyl benzoate	GTEP	20-60	754-765 (1)	2.7-9.0	202	Seliverstov	1964	U.S.S.R.	English
R12 + Butyl benzoate	GTEP	20-60	754-765 (1)	2.64-9.4	202	Seliverstov	1964	U.S.S.R.	English
R12 + Dimethyl phthalate	GTEP	20-60	754-765 (1)	1.28-4.2	202	Seliverstov	1964	U.S.S.R.	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.9.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R12 + Diethyl phthalate	GTEP	20-60	754-765 (1)	1.9-8.2	202	Seliverstov	1964	U.S.S.R.	English
R12 + Dibutyl phthalate	GTEP	20-60	754-765 (1)	4.5-9.8	202	Seliverstov	1964	U.S.S.R.	English
R12 + Benzyl acetate	GTEP	20-60	754-765 (1)	1.9-5.6	202	Seliverstov	1964	U.S.S.R.	English
R12 + Dibutyl sebacate	GTEP	20-60	754-765 (1)	5.3-15.5	202	Seliverstov	1964	U.S.S.R.	English
R12 + Methyl salicylate	GTEP	20-60	754-765 (1)	1.9-5.0	202	Seliverstov	1964	U.S.S.R.	English
R12 + DMETEG: Benzyl alcohol (1:1)(M)	TE	38-121	5.23-38.9	12.7-44.6	81	Hesselberth	1965	U.S.A.	English
R12 + R22: DMETEG	TE	38-121	2.83-35.4	4.7-70.5 22.6-91.6	81	Hesselberth	1965	U.S.A.	English
R12 + R22:DMA	TE	38-121	3.93-36.7	1.1-69.4 19.2-89.6	81	Hesselberth	1965	U.S.A.	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.9.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R12 + R22: DMETEG:Benzyl alcohol (1:1)(M)	TE	38-121	4.27-40.0	1.7-54.5 18.0-86.6	81	Hesselberth	1965	U.S.A.	English
9.4. Heat of Mixing									
R12 + DMF	TE	-20-50	740 (1)	1.8-16.4	130	Makitra	1979	U.S.S.R.	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.10.0. REFRIGERANT 133A BINARY AND MULTICOMPONENT ABSORPTION FLUIDS PROPERTIES DATA

A.10.1. Vapor-Liquid Equilibrium

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R133a + DMETEG	TE	30-80	0.8	12.9-43.4	27	Bokelmann	1983	Germany	English
R133a + DMETEG	TE	20-80	0.8	12.9-43.4	28	Bokelmann	1983	Germany	English
R133a + DMETrEG	TE	30-70	0.8	17.4-43.8	27	Bokelmann	1983	Germany	English
R133a + DMETrEG	TE	30-70	0.8	17.4-43.8	28	Bokelmann	1983	Germany	English
R133a + EFTE	GS	32-177	0.138-13.1	4.6-56.7	5	Allen	1979	U.S.A.	English
R133a + ETFE	TE	30-80	0.8	11.7-45.2	27	Bokelmann	1983	Germany	English
R133a + ETFE	TE	20-80	0.8	11.7-45.2	28	Bokelmann	1983	Germany	English
R133a + NMP	GS	0-200	0.1-10	0-100	191	Rolland	1981	France	French
R133a + NMP	GS	10-50	0-700 (1)	0-80	191	Rolland	1981	France	French
R133a + NMP	TE	30-70	0.8	23.7-55.1	27	Bokelmann	1983	Germany	English
R133a + NMP	TE	30-70	0.8	23.7-55.1	28	Bokelmann	1983	Germany	English
R133a + DMF	TE	30-70	0.8	17.0-58.9	27	Bokelmann	1983	Germany	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg

R - Refrigerant
A - Absorbent(s)
(2) - mbar

c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.10.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R133a + DMF	TE	30-70	0.8	17.0-58.9	28	Bokelmann	1983	Germany	English
R133a + DEF	TE	20-70	0.8	22.3-62.4	27	Bokelmann	1983	Germany	English
R133a + DEF	TE	20-70	0.8	22.3-62.4	28	Bokelmann	1983	Germany	English
R133a + HMPT	TE	30-80	0.8	23.7-43.4	27	Bokelmann	1983	Germany	English
R133a + HMPT	TE	20-80	0.8	23.7-51.3	28	Bokelmann	1983	Germany	English
R133a + TBP	TE	30-70	0.8	16.5-38.0	27	Bokelmann	1983	Germany	English
R133a + TBP	TE	30-70	0.8	16.5-38.0	28	Bokelmann	1983	Germany	English
A.10.4. Heat of Mixing									
R133a + NMP	GS	NA	NA	0-100	191	Rolland	1981	France	French
A.10.5. Liquid-Phase Densities									
R133a + NMP	GS	0-160	NA	0-100	191	Rolland	1981	France	French
R133a + ETFE	TEP	-60-250	NA	0.0-60.0	5	Allen	1979	U.S.A.	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.10.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
A.10.6. Vapor-Liquid-Phase Enthalpies									
R133a + NMP	GS	-10-160	0.1-15	0-100	191	Rolland	1981	France	French
A.10.8. Stability									
R133a + NMP	TE	180	NA	NA	17	Bertocchio	1985	France	French
R133a + DMETrEG	TE	180	NA	NA	17	Bertocchio	1985	France	French
R133a + ETFE	TE	24-177	NA	20.0	150	Murphy	1982	U.S.A.	English
A.10.9. Viscosity									
R133a + NMP	GS	0-200	NA	5-50	191	Rolland	1981	France	French
R133a + ETFE	GSP	0-80	NA	0.0-100.0	5	Allen	1979	U.S.A.	English
A.10.12. Thermal Conductivity									
R133a + NMP	GS	0-150	NA	0-50	191	Rolland	1981	France	French
R133a + ETFE	TEP	-7-127	NA	0.0, 100.0	5	Allen	1979	U.S.A.	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg

R - Refrigerant
A - Absorbent(s)
(2) - mbar

c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.10.0. (Cont.)

A.10.15. Surface Tension

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R133a + NMP	GS	0-160	NA	0-50	191	Rolland	1981	France	French
A.10.16. Toxicity									
R133a + ETFE	TE	NA	NA	0.0, 100.0	150	Murphy	1982	U.S.A.	English
A.10.17. Flammability									
R133a + ETFE	TE	10.3-24.1	NA	0.0-100.0	150	Murphy	1982	U.S.A.	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.11.0. REFRIGERANTS 123 AND 123A BINARY AND MULTICOMPONENT ABSORPTION FLUIDS PROPERTIES DATA

A.11.1. Vapor-Liquid Equilibrium

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R123a + DMETEG	TEP GTS	-20-200	50-5000 (2)	0-100	29	Bokelmann	1984	Germany	German
R123a + DMETEG	GS	-20-200	10-5000 (2)	0-95	26	Bokelmann	1983	Germany	English
R123a + DMETEG	GS	-20-200	10-5000 (2)	0-95	32	Bokelmann	1985	Germany	English
R123a + DMETEG	TE	20-80	0.35	12.8-62.4	27	Bokelmann	1983	German	English
R123a + DMETEG	GS	-20-200	10-5000 (2)	0-95	28	Bokelmann	1985	Germany	English
R123a + DMETrEG	TE	20-70	0.35	12.7-53.1	27	Bokelmann	1983	German	English
R123a + EFTE	TSGP	-32-238	0.069-6.89	0.0-100.0	151	Murphy	1983	U.S.A.	English
R123a + ETFE	GE	38-193	1.38-2.76	0.7-93.1	151	Murphy	1983	U.S.A.	English
R123 + DMH	GS	0-150	NA	NA	18	Biermann	1978	U.S.A.	English
R123 + NMP	GS	0-150	NA	18.0-50.0	18	Biermann	1978	U.S.A.	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.11.0. (Cont.)

A.11.3. Corrosion

Fluid System	Data Type	Inhibitors	Temp. Range, °C	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R123a + DMETEG	TE	TNP EP BO EPC AGE DEO BGE PGE EPM CPE DEC Test with & without inhibitors	180	NA	159	Oouchi	1985	Japan	Japanese

A.11.4. Heat of Mixing

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R123a + ETFE	P	24-204	0.069-6.89	0.0-100.0	151	Murphy	1983	U.S.A.	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg

R - Refrigerant
A - Absorbent(s)
(2) - mbar

c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.11.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
A.11.5. Liquid-Phase Densities									
R123a + ETFE	TE	180	NA	NA	159	Oouchi	1985	Japan	Japanese
R123a + DMETEG	TEP GS	20-90	NA	0-100	29	Bokelmann	1984	Germany	German
A.11.6. Vapor-Liquid-Phase Enthalpies									
R123a + DMETEG	GS	0-200	100-5000 (2)	0-100	31	Bokelmann	1985	Germany	English
R123a + DMETEG	TSGP	24-204	0.069-6.89	0.0-100.0	151	Murphy	1983	U.S.A.	English
A.11.8. Stability									
R123 + DMETrEG	TE	180	NA	NA	17	Bertocchio	1985	France	French
R123a + DMETEG	Nar.	NA	NA	NA	29	Bokelmann	1984	Germany	German
R123a + ETFE	TE	21-177	NA	NA	151	Murphy	1983	U.S.A.	English
A.11.9. Viscosity									
R123a + DMETEG	TEP GS	10-90	NA	0-100	29	Bokelmann	1984	Germany	Germany
R123a + ETFE	GSPC	20-80	NA	0.0-100.0	151	Murphy	1983	U.S.A.	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg

R - Refrigerant
A - Absorbent(s)
(2) - mbar

c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.12.0. FLUORO-ALCOHOL BINARY AND MULTICOMPONENT ABSORPTION FLUIDS PROPERTIES DATA

A.12.1. Vapor-Liquid Equilibrium

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
TFE + DMETEG	TGE	73-191	725 (1)	0-100 74-100	201	Seher	1983	Germany	German
TFE + DMETEG	GS	-10-200	0.01-1.5	0-100 74-100	201	Seher	1983	Germany	German
TFE + DMETEG	GS	-10-210	0.008-2	0-100	200	Seher	1985	Germany	German
TFE + DMETEG	GS	15-225	0.01-1	0-100	200	Seher	1985	Germany	German
TFE + DMETEG	GE	40-190	960 & 200 (2)	0-100	200	Seher	1985	Germany	German
TFE + DMETEG	TE	20-80	0.02-0.38	2.9-57.4	27	Bokelmann	1983	Germany	English
TFE + DMETEG	GS	0	65-1000 (2)	40-90	153	Nowaczyk	1986	Germany	English
TFE + DMETrEG	TE	20-80	0.02	0.7-29.9	27	Bokelmann	1983	Germany	English
TFE + NMP	TE	20-80	0.02-0.38	14.0-70.0	27	Bokelmann	1983	Germany	English
TFE + NMP	TEP	-20-200	1-915 (2)	0-100	29	Bokelmann	1984	Germany	German
TFE + NMP	GTS	-20-200	1-1000 (2)	0-100	29	Bokelmann	1984	Germany	German

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.12.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
TFE + NMP	GS	-20-200	1-1000 (2)	0-100	32	Bokelmann	1985	Germany	English
TFE + NMP	GS	-20-200	1-1000 (2)	0-100	26	Bokelmann	1983	Germany	English
TFE + NMP	TE	0.1-180	2.2-915.4 (2)	12.3-68.2	25	Bokelmann	1983	Germany	German
TFE + TEG	GE	40-160	918 & 200 (2)	0-100	200	Seher	1985	Germany	German
TFE + TEG	TE	20-80	0.02-0.38	2.5-52.7	27	Bokelmann	1983	Germany	English
TFE + HMPT	TE	20-80	0.02-0.38	0.5-63.6	27	Bokelmann	1983	Germany	English
TFE + QUN	TE	20-80	0.02	0.3-49.4	27	Bokelmann	1983	Germany	English
TFE + QUN	GTE	100-190	0.8681-0.8756	1.84-47.85	65	Girsberger	1951	Switzerland	German
TFE + QUN	GTE	100-190	0.5736-0.5780	1.49-39.52	65	Girsberger	1951	Switzerland	German
TFE + TBP	TE	20-80	0.02	0.3-31.5	27	Bokelmann	1983	Germany	English
TFE + QUI	TE	20-80	0.02	0.5-39.6	27	Bokelmann	1983	Germany	English
TFE + DWA	GTE	100-190	0.8705-0.8774	0.76-5.67	65	Girsberger	1951	Switzerland	German
TFE + BZL	GTE	100-190	0.8679-0.8752	1.45-28.8	65	Girsberger	1951	Switzerland	German

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.12.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
TFE + DMPU	GS	0	65-1000 (2)	40-90	153	Nowaczyk	1986	Germany	English
TFE + DMPU	GS	-20-200	1-1000 (2)	20-100	153	Nowaczyk	1986	Germany	English
TFE + DMEU	GS	0	65-1000 (2)	40-90	153	Nowaczyk	1986	Germany	English
TFE + NMC	GS	0	65-1000 (2)	40-90	153	Nowaczyk	1986	Germany	English
HFIP + QUN	GTE	100-200	1.6029-1.6175	24.3-71.3	65	Girsberger	1951	Switzerland	German
HFIP + QUN	GTE	110-190	1.0940-1.0998	21.6-62.8	65	Girsberger	1951	Switzerland	German
HFIP + DMPU	GS	10	250-1500 (2)	20-80	153	Nowaczyk	1986	Germany	English
HFIP + DMEU	GS	10	250-1500 (2)	20-80	153	Nowaczyk	1986	Germany	English
HFIP + NMC	GS	10	250-1500 (2)	20-80	153	Nowaczyk	1986	Germany	English
HFIP + NFM	GS	10	250-1500 (2)	20-80	153	Nowaczyk	1986	Germany	English
HFIP + DMETEG	GS	10	250-1500 (2)	20-80	153	Nowaczyk	1986	Germany	English
HFIP + SL	GS	10	250-1500 (2)	20-80	153	Nowaczyk	1986	Germany	English
HFIP + PC	GS	10	250-1500 (2)	20-80	153	Nowaczyk	1986	Germany	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.12.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
HFIP + EC	GS	10	250-1500 (2)	20-80	153	Nowaczyk	1986	Germany	English
HFIP + CUM	GS	10	250-1500 (2)	20-80	153	Nowaczyk	1986	Germany	English
PFPA + DMETEG	GS	0	25-550 (2)	20-50	153	Nowaczyk	1986	Germany	English
PFPA + DMETEG	GS	-20-200	1-1000 (2)	40-100	153	Nowaczyk	1986	Germany	English

A.12.3. Corrosion

Fluid System	Data Type	Inhibitors	Temp. Range, °C	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
TFE + DMETEG	TE	NA	120	NA	200	Seher	1985	Germany	German
TFE + DMETEG	TE	None	110 & 130	4.0 & 5.0	67	Griess	1985	U.S.A.	English
TFE + NMP	TE	None	110	7.0	67	Griess	1985	U.S.A.	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg

R - Refrigerant
A - Absorbent(s)
(2) - mbar

c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.12.0. (Cont.)

A.12.4. Heat of Mixing

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
TFE + DMETEG	GE	20	NA	0-100	200	Seher	1985	Germany	German
TFE + DMPU	GS	30	NA	0-100	153	Nowaczyk	1986	Germany	English
TFE + NMP	GS	30	NA	0-100	153	Nowaczyk	1986	Germany	English
HFIP + DMETEG	GS	30	NA	0-100	153	Nowaczyk	1986	Germany	English
HFIP + NFM	GS	30	NA	0-100	153	Nowaczyk	1986	Germany	English
A.12.5. Liquid-Phase Densities									
TFE + DMETEG	GS	20-70	NA	0-100	200	Seher	1985	Germany	German
TFE + DMETEG	GS	0-200	NA	0-100	200	Seher	1985	Germany	German
TFE + NMP	TEP GS	20-90	NA	0-100	29	Bokelmann	1984	Germany	German
TFE + TEG	GS	20-70	NA	0-100	200	Seher	1985	Germany	German
HFIP + QUN	TE	20	NA	20-75	65	Girsberger	1951	Switzerland	German

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.12.0. (Cont.)

A.12.6. Vapor-Liquid-Phase Enthalpies

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
TFE + NMP	GS	0-200	1-1000 (2)	0-100	31	Bokelmann	1984	Germany	English
TFE + NMP	GS	40-220	350 (2)	0-100	154	Nowaczyk	1987	Germany	English
TFE + DMETEG	GS	0-200	0.01-2	0-100	200	Seher	1985	Germany	German
TFE + DMPU	GS	40-220	350 (2)	0-100	154	Nowaczyk	1987	Germany	English
TFE + DMEU	GS	40-220	350 (2)	0-100	154	Nowaczyk	1987	Germany	English
A.12.8. Stability									
TFE + NMP	Nar.	NA	NA	NA	29	Bokelmann	1984	Germany	German
A.12.9. Viscosity									
TFE + NMP	TEP GS	10-90	1	0-100	29	Bokelmann	1984	Germany	German
TFE + DMETEG	GS	20-70	NA	0-100	200	Seher	1985	Germany	German
TFE + TEG	GS	20-70	NA	0-100	200	Seher	1985	Germany	German

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.12.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
TFE + DMPU	GS	20-80	NA	0-80	154	Nowaczyk	1987	Germany	English
HFIP + DMPU	GS	20-80	NA	0-100	154	Nowaczyk	1987	Germany	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.13.0. REFRIGERANT 124A AND 124 BINARY AND MULTICOMPONENT ABSORPTION FLUIDS PROPERTIES DATA

A.13.1. Vapor-Liquid Equilibrium

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R124a + DMETEG	TE	35-177	0.552-8.41	5.9-67.5	132	Mastrangelo	1959	U.S.A.	English
A.13.8. Stability									
R124 + DMF	GE	100-240	NA	NA	8	Ando	1983	Japan	Japanese
R124 + DMA	GE	100-240	NA	NA	8	Ando	1983	Japan	Japanese
R124 + DMEDEG	GE	100-240	NA	NA	8	Ando	1983	Japan	Japanese
R124 + DMETEG	GE	100-240	NA	NA	8	Ando	1983	Japan	Japanese
R124 + DMA: Phosphite	GE	100-240	NA	NA	8	Ando	1983	Japan	Japanese
R124 + NMP	TE	180	NA	NA	17	Bertocchio	1985	France	French

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.14.0. REFRIGERANTS 31, 30, 11, 13, 134, 142 AND 143A BINARY AND MULTICOMPONENT ABSORPTION FLUIDS PROPERTIES DATA

A.14.1. Vapor-Liquid Equilibrium

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R11 + DMETEG	TE	25-121	0.345-6.07	19.8-62.8	35	Buclez	1959	U.S.A.	English
R11 + DMETEG	GE	25-121	0.34-6.1	20.0-63.0	2	Albright	1960	U.S.A.	English
R11 + 2-octanone	TE	25-121	0.414-5.86	27.9-71.5	35	Buclez	1959	U.S.A.	English
R11 + Linoleic acid	TE	25-121	0.414-5.52	15.8-54.5	35	Buclez	1959	U.S.A.	English
R11 + Diethyl malonate	TE	25-107	0.621-7.45	38.9-71.6	172	Pluche	1959	U.S.A.	English
R11 + n-heptyl alcohol	TE	38-93	0.965-5.93	44.5-77.4	172	Pluche	1959	U.S.A.	English
R13 + DMF	TE	-20-50	740 (1)	0.3-1.6	130	Makitra	1979	U.S.S.R.	English
R31 + DMETEG	TE	35-177	1.52-8.96	4.7-39.8	132	Mastrangelo	1959	U.S.A.	English
R30 + DMETEG	GS	27-177	0.138-1.31	4.1-14.1	52	Ellington	1957	U.S.A.	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.14.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R134 + DMETEG	TE	28-86	0.276-5.03	6.5-56.6	132	Mastrangelo	1959	U.S.A.	English
R142 + Dicumyl-methane	TGEP	20-60	754-765 (1)	6.3-17.0	202	Seliverstov	1964	U.S.S.R.	English
R142 + Oleic acid	TGEP	20-60	754-765 (1)	9.0-19.0	202	Seliverstov	1964	U.S.S.R.	English
R142 + Methyl benzoate	TGEP	20-60	754-765 (1)	6.0-15.4	202	Seliverstov	1964	U.S.S.R.	English
R142 + Propyl benzoate	TGEP	20-60	754-765 (1)	7.3-16.7	202	Seliverstov	1964	U.S.S.R.	English
R142 + Butyl-benzoate	TGEP	20-60	754-765 (1)	7.0-19.0	202	Seliverstov	1964	U.S.S.R.	English
R142 + Dimethyl phthalate	TGEP	20-60	754-765 (1)	6.0-13.0	202	Seliverstov	1964	U.S.S.R.	English
R142 + Diethyl phthalate	TGEP	20-60	754-765 (1)	8.0-19.0	202	Seliverstov	1964	U.S.S.R.	English
R142 + Dibutyl phthalate	TGEP	20-60	754-765 (1)	9.4-24.0	202	Seliverstov	1964	U.S.S.R.	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.14.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R142 + Benzl acetate	TGEP	20-60	754-765 (1)	6.0-15.6	202	Seliverstov	1964	U.S.S.R.	English
R142 + Dibutyl sebacate	TGEP	20-60	754-765 (1)	13.8-30.5	202	Seliverstov	1964	U.S.S.R.	English
R142 + Methyl salicylate	TGEP	20-60	754-765 (1)	6.0-13.6	202	Seliverstov	1964	U.S.S.R.	English
A.14.4. Heat of Mixing									
R13 + DMF	TE	-20-50	740 (1)	0.3-1.6	130	Makitra	1979	U.S.S.R.	English
A.14.8. Stability									
R134 + NMP	TE	180	NA	NA	17	Bertocchio	1985	France	French
R143a + NMP	TE	180	NA	NA	17	Bertocchio	1985	France	French

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.15.0. REFRIGERANTS 1123, 1113, 1130, 1120, 1112A, 216, 140A AND 131A BINARY AND MULTICOMPONENT ABSORPTION FLUIDS PROPERTIES DATA

A.15.1. Vapor-Liquid Equilibrium

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
R1130 + DMH	TE	20-170	0.0017-1.01	2.5-52.4	18	Biermann	1978	U.S.A.	English
R1130 + DMD	TE	19-170	0.014-1.01	5.5-70.0	18	Biermann	1978	U.S.A.	English
R1120 + DMD	TE	20-136	0.026-1.01	16.3-71.8	18	Biermann	1978	U.S.A.	English
R1112a + DMH	TE	21-136	0.055-1.01	4.1-58.8	18	Biermann	1978	U.S.A.	English
R140a + DMD	TE	20-162	0.010-1.01	11.7-80.4	18	Biermann	1978	U.S.A.	English
R131a + DMH	TE	24-175	0.0053-1.00	16.5-100.0	18	Biermann	1978	U.S.A.	English
R1123 + DMF	TE	-20-50	740 (1)	1.6-9.5	130	Makitra	1979	U.S.S.R.	English
R1123 + DMF	TE	-20-50	740 (1)	2.4-16.9	130	Makitra	1979	U.S.S.R.	English
R216 + DMF	TE	-20-50	740 (1)	0.9-6.6	130	Makitra	1979	U.S.S.R.	English
A.15.4. Heat of Mixing									
R1123 + DMF	TE	-20-50	740 (1)	1.6-9.5	130	Makitra	1979	U.S.S.R.	English
R1113 + DMF	TE	-20-50	740 (1)	2.4-16.9	130	Makitra	1979	U.S.S.R.	English

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.16.0. OTHER BINARY AND MULTICOMPONENT ABSORPTION FLUIDS PROPERTIES DATA

A.16.1. Vapor-Liquid Equilibrium

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
Hexane + TDK	GTE	100-190	1.0352-1.0426	3.45-26.1	65	Girsberger	1951	Switzerland	German
CH_3CN + LiCl	TE	18 & 25	NA	99.8 & 99.9	164	Pavlopoulos	1954	Germany	German
CH_3CN + LiBr	TE	18 & 25	NA	91.9 & 92.4	164	Pavlopoulos	1954	Germany	German
CH_3CN + LiI	TE	18 & 25	NA	39.4 & 40.5	164	Pavlopoulos	1954	Germany	German
CH_3CN + NaF	TE	18 & 25	NA	99.9 & 99.9	164	Pavlopoulos	1954	Germany	German
CH_3CN + NaCl	TE	18 & 25	NA	99.9 & 99.9	164	Pavlopoulos	1954	Germany	German
CH_3CN + NaBr	TE	18 & 25	NA	99.9	164	Pavlopoulos	1954	Germany	German
CH_3CN + NaI	TE	18 & 25	NA	80.0 & 80.6	164	Pavlopoulos	1954	Germany	German
CH_3CN + KF	TE	18 & 25	NA	99.9 & 99.9	164	Pavlopoulos	1954	Germany	German
CH_3CN + KCl	TE	18 & 25	NA	99.9	164	Pavlopoulos	1954	Germany	German
CH_3CN + KBr	TE	18 & 25	NA	99.9	164	Pavlopoulos	1954	Germany	German
CH_3CN + KI	TE	18 & 25	NA	97.9	164	Pavlopoulos	1954	Germany	German

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.16.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
CH_3CN + RbCl	TE	18 & 25	NA	99.9	164	Pavlopoulos	1954	Germany	German
CH_3CN + RbBr	TE	18 & 25	NA	99.9 & 99.9	164	Pavlopoulos	1954	Germany	German
CH_3CN + RbI	TE	18 & 25	NA	98.2 & 98.4	164	Pavlopoulos	1954	Germany	German
CH_3CN + CsCl	TE	18 & 25	NA	99.9	164	Pavlopoulos	1954	Germany	German
CH_3CN + CsBr	TE	18 & 25	NA	99.9 & 99.9	164	Pavlopoulos	1954	Germany	German
CH_3CN + CsI	TE	18 & 25	NA	99.1 & 99.3	164	Pavlopoulos	1954	Germany	German
CHOOH + LiCl	TE	18 & 25	NA	78.7 & 79.4	164	Pavlopoulos	1954	Germany	German
CHOOH + LiBr	TE	18 & 25	NA	54.9 & 55.6	164	Pavlopoulos	1954	Germany	German
CHOOH + LiI	TE	18 & 25	NA	40.7 & 41.8	164	Pavlopoulos	1954	Germany	German
CHOOH + NaCl	TE	18 & 25	NA	5.2	164	Pavlopoulos	1954	Germany	German
CHOOH + NaBr	TE	18 & 25	NA	83.8 & 83.8	164	Pavlopoulos	1954	Germany	German
CHOOH + NaI	TE	18 & 25	NA	61.7 & 62.1	164	Pavlopoulos	1954	Germany	German
CHOOH + KCl	TE	18 & 25	NA	83.9 & 84.0	164	Pavlopoulos	1954	Germany	German

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.16.0. (Cont.)

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
CHOOH + KBr	TE	18 & 25	NA	81.5 & 81.7	164	Pavlopoulos	1954	Germany	German
CHOOH + KI	TE	18 & 25	NA	73.9 & 74.1	164	Pavlopoulos	1954	Germany	German
CHOOH + RbCl	TE	18 & 25	NA	62.5 & 64.1	164	Pavlopoulos	1954	Germany	German
CHOOH + RbBr	TE	18 & 25	NA	66.4 & 67.1	164	Pavlopoulos	1954	Germany	German
CHOOH + RbI	TE	18 & 25	NA	68.0 & 68.5	164	Pavlopoulos	1954	Germany	German
CHOOH + CsCl	TE	18 & 25	NA	43.5 & 48.3	164	Pavlopoulos	1954	Germany	German
CHOOH + CsBr	TE	18 & 25	NA	58.5 & 59.2	164	Pavlopoulos	1954	Germany	German
CHOOH + CsI	TE	18 & 25	NA	77.5 & 78.1	164	Pavlopoulos	1954	Germany	German
A.16.4. Heat of Mixing									
Benzene + Cyclohexane	TE	30	NA	16.0-81.2	217	Sosnkowska	1965	Poland	English
t-Butyl Alcohol + Benzene	GTEP	30 & 50	NA	28.6-92.6	217	Sosnkowska	1965	Poland	English

X - Liquid Phase
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(1) - mmHg
R - Refrigerant
A - Absorbent(s)
(2) - mbar
c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available

Table A.16.0. (Cont.)

A.16.14. Entropy

Fluid System	Data Type	Temp. Range, °C	Press. Range, atm	Weight, % X (R) Y (R)	Reference No.	Author	Year	Country	Text
t-Butyl Alcohol + Benzene	GS	30, 50 & 70	NA	0.0-100.0	164	Pavlopoulos	1954	Germany	German

X - Liquid Phase
Y - Vapor Phase
(1) - mmHg

R - Refrigerant
A - Absorbent(s)
(2) - mbar

c - ppm by weight of A in Vapor Phase
M - Mole, W - Weight
NA - Not Available