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SOME PHYSICAL PROPERTIES OF THE VOLATILE HYDRIDES

Compiled by William L. Jolly

April 1961

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University of California, Berkeley, California

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ABSTRACT

Various physical properties (thermodynamic functions at 25° melting point, heat and entropy of fusion, density, vapor pressures, and heat and entropy of vaporization) are tabulated for all volatile hydrides.

This preliminary compilation has been made for the benefit of experimental chemists who frequently work with volatile inorganic hydrides. As it stands, the compilation is very incomplete and probably contains a number of inaccuracies. It is hoped that users will inform the compiler of any new or better data which should be included.

An attempt has been made to include all the volatile inorganic hydrides which are likely to be of interest to "vacuum-line chemists." Practically no carbon-containing compounds are included. Salt-like compounds such as NH_4Cl, although volatile, are not included. Oxy-acids such as H_2SO_4 are not included.

The hydrides are grouped according to the extended form of the periodic table. Tabulated hydrides containing more than one other element besides hydrogen are cross-indexed whenever ambiguity might exist. All the data for each hydride are presented in one row extending across two facing pages. The column headings are self-explanatory, but the following comments may be helpful.

Except for a few clearly marked exceptions, the thermodynamic functions at 25° are for compounds in their most stable state at that temperature. For example, the functions apply to gaseous B_2H_6, liquid B_5H_9, and solid $B_{10}H_{14}$. When necessary, the states of matter are distinguished by the symbols (g), (l), and (s) after the formulas.

The liquid densities are sometimes expressed as functions of temperature. Here t and T refer to $^{\circ}C$ and $^{\circ}K$, respectively.

The vapor pressure of a substance at a particular "slush-bath" temperature is a useful datum for purposes of identification and for estimating purity. When known, vapor pressures for the following "slush baths" are tabulated:

water	0°	(0°)
carbon tetrachloride	-22.9	(CCl_4)
chlorobenzene	-45.2	(C_6H_5Cl)
chloroform	-63.5	($CHCl_3$)
ethyl acetate	-83.6	(EtAc)
carbon disulfide	-111.6	(CS_2)
methylcyclohexane	-126.3	(MCH)

The abbreviations listed in the third column above are used to identify slush baths in the compilation. It is seldom satisfactory to calculate slush-bath vapor pressures from published vapor-pressure equations. Except for certain data clearly marked as approximate, the vapor pressures in this compilation

were all obtained by direct observation with actual slush baths. The compiler solicits such vapor pressure data for inclusion in the tables.

The letter-number notations directly beneath the data refer to literature references which are listed separately at the end. When no reference is given for a datum, it is to be understood that the source is the National Bureau of Standards Circular 500, "Selected Values of Chemical Thermodynamic Properties," Washington, D. C., 1952. References to physical properties not normally included in the table are placed in the "Remarks" column. In particular, references to infra-red spectra are given here.

COMPOUND	THERMODYNAMIC FUNCTIONS AT 25°C				MELTING POINT °C	ΔH° OF FUSION kcal./mole	ΔS° OF FUSION cal./deg. mole
	ΔH°_f kcal./mole	ΔF°_f kcal./mole	S° cal./deg. mole	C°_p cal./deg. mole			
H_2	0	0	31.211	6.892	-259.20	0.028	2.0
HD	0.037	-0.391	34.341	6.98	-256.56	0.038	2.3
HT			38.202 J4	6.978 J4			
D_2	0	0	34.602	6.98	-254.43 G4	0.047	2.5
DT							
T_2	0	0	39.394 J4	6.978 J4	-252.89 G4		
H(g)	52.089	48.575	27.3927	4.9680			
D(g)	52.982	49.358	29.456	4.9680			
T(g)							

DENSITY OF LIQUID (°C)	VAPOR PRESSURE EQUATION FOR LIQUID log P_{mm} =	BOILING POINT (°C)	VAPOR PRESSURE (SLUSH BATH)	ΔH° OF VAPN. AT B.P.	ΔS° OF VAPN. AT B.P.	REMARKS
0.07099	14-20°K: -44.9569/T	-252.77		0.216	10.6	
(-252.78°) S6	+4.66687 + 0.020537T					
	19.5-24.5°K: -54.650/T					
	+6.0842-0.0480T					
	$+10.9 \times 10^{-4}T^2$ G4					
		-251.03				
0.1636	-70.044/T + 6.0832	-249.49 G4		0.293 G4	12.4 G4	
(-249.75°) K2	$-0.02111T+4.59 \times 10^{-4}T^2$ G4					
	-76.323/T + 5.9444 G4	-248.24 G4		0.322 G4	12.9 G4	

COMPOUND	THERMODYNAMIC FUNCTIONS AT 25°C				MELTING POINT °C	$\Delta H°$ OF FUSION kcal./mole	$\Delta S°$ OF FUSION cal./deg. mole
	$\Delta H°_f$ kcal./mole	$\Delta F°_f$ kcal./mole	$S°$ cal./deg. mole	$C°_p$ cal./deg. mole			
$Be(BH_4)_2$							

DENSITY OF LIQUID (°C)	VAPOR PRESSURE EQUATION FOR LIQUID $\log P_{mm}$ =	BOILING POINT (°C)	VAPOR PRESSURE (SLUSH BATH)	ΔH° OF VAPN. AT B.P.	ΔS° OF VAPN. AT B.P.	REMARKS
	-3240/T + 11.772* B3	91.3* B3				*sublimation

COMPOUND	THERMODYNAMIC FUNCTIONS AT 25°C				MELTING POINT °C	ΔH° OF FUSION kcal./mole	ΔS° OF FUSION cal./deg. mole
	ΔH°_f kcal./mole	ΔF°_f kcal./mole	S° cal./deg. mole	C°_p cal./deg. mole			
B_2H_6	7.53 N1	19.78 N1	55.34 N1	13.30 N1	-164.86 C1	1.069 C1	9.87 C1
B_2D_6							
B_4H_{10}					-120.8 S13		
B_5H_9	7.72 N1	38.56 N1	44.03 N1	36.12 N1	-46.75 W1	1.466 C3	6.48 calc
B_5H_{11}					-123.2		
B_6H_{10}					-65.1 K8		
B_6H_{12}					-90 S15		
B_9H_{15}					-23 K7		
$B_{10}H_{14}$	-15.8 N2	40.9 calc	42.20 N1	52.09 N1	99.5	7.8	20.9
$B_3N_3H_6$ (ℓ)	-131.1 N1	-95.7 N1	47.8 N1				
BH_3CO (g)	-27.01 N1	-22.66 N1	59.48 N1	13.86 N1	-137 B5		

DENSITY OF LIQUID (°C)	VAPOR PRESSURE EQUATION FOR LIQUID log P_{mm} =	BOILING POINT (°C)	VAPOR PRESSURE (SLUSH BATH)	ΔH° OF VAPN. AT B.P.	ΔS° OF VAPN. AT B.P.	REMARKS
0.447(-112°) S12	8.1110-870.95/T -2.221 x 10^{-3}T C1	-92.84 C1	225(CS_2) B4	3.412 C1	18.89 C1	see A6 or L2 for I.R. spectrum
	-925.9/T + 8.102 K3	-95.9 K3	238(CS_2) B4	4.23 K3	23.9 K3	
0.56(-35°) S12		16 S14	386(0°) K7	6.47 S14	22.4 S14	
0.8674 -.00082T°K S9	9.96491-1951.14/T -0.003688T W1		66(0°) S12			see W1 for diel. const.
	-1690.3/T + 7.901 S14	65		7.61	22.5	
0.69(0°) S12		94	7.2(0°) S12			
0.78(100°) S12	-3645/T + 10.954 N3					
0.824(0°) S12	-1457.5/T + 1.75 log T -0.0010435T + 3.2875 S12		85.3(0°) S11			see C2 for I.R. spectrum
	-1040/T + 7.85 B5	-64 B5	25.4(CS_2) B5	4.75 B5	23.0 B5	

COMPOUND	THERMODYNAMIC FUNCTIONS AT 25°C				MELTING POINT °C	ΔH° OF FUSION kcal./mole	ΔS° OF FUSION cal./deg. mole
	ΔH°_f kcal./mole	ΔF°_f kcal./mole	S° cal./deg. mole	C°_p cal./deg. mole			
$B_3N_3H_5Cl$					-34.6 S11		
$B_3N_3H_5Br$					-34.8 S11		
$B_3N_3H_4Cl_2$					33.5 S11		
$B_3N_3H_4Br_2$					50.0 S11		
B_2H_5Br					-104° S12		
B_2H_5I							
BD_3CO					-134.4 B4		
$BF_3 \cdot NH_3$	-318.9 N1				163 L1		
$B_3N_3H_3Cl_3$	-252.2 V1				84.5 B6		
$Be(BH_4)_2$	see under beryllium compounds						
$Al(BH_4)_3$	-74.7 N1	-36.2 N1	69.13 N1	46.8 N1	-64.5	1.68 K4	8.05 K5
Ga_2H_6					-21.4 E3		

DENSITY OF LIQUID (°C)	VAPOR PRESSURE EQUATION FOR LIQUID log P_{mm} =	BOILING POINT (°C)	VAPOR PRESSURE (SLUSH BATH)	ΔH° OF VAPN. AT B.P.	ΔS° OF VAPN. AT B.P.	REMARKS
	-1846/T + 7.703 S11	109.5 S11	8.6(0°) S11	8.44 S11	22.1 S11	
	-2172/T + 8.373 S11	122.3 S11		9.94 S11	25.1 S11	
	-1994/T + 7.572 S11	151.9 S11		9.12 S11	21.5 S11	
	-2849/T + 9.352 S11	167.1 S11		13.04 S11	29.6 S11	
		ca. 10 S12				
1.8(-108°) S12			78(0°) S12			
	-1040/T + 7.810 B4		23.0(CS_2) B4			
	-2497/T + 8.25 B6			12.3 B6		
0.7866 -0.000793T°K S9	-1565/T + 7.808 S10	45		7.2	22.6	
		139 E3				decomp. 130°

COMPOUND	THERMODYNAMIC FUNCTIONS AT 25°C				MELTING POINT °C	$\Delta H°$ OF FUSION kcal./mole	$\Delta S°$ OF FUSION cal./deg. mole
	$\Delta H°_f$ kcal./mole	$\Delta F°_f$ kcal./mole	$S°$ cal./deg. mole	$C°_p$ cal./deg. mole			
$Th(BH_4)_4$					203 H1		
$U(BH_4)_4$							

DENSITY OF LIQUID (°C)	VAPOR PRESSURE EQUATION FOR LIQUID log P_{mm} =	BOILING POINT (°C)	VAPOR PRESSURE (SLUSH BATH)	ΔH° OF VAPN. AT B.P.	ΔS° OF VAPN. AT B.P.	REMARKS
		13.9*		23*	56*	*sublimation, 0.1 mm.
	-4265/T + 13.354* S8					*sublimation

COMPOUND	THERMODYNAMIC FUNCTIONS AT 25°C				MELTING POINT °C	$\Delta H°$ OF FUSION kcal./mole	$\Delta S°$ OF FUSION cal./deg. mole
	$\Delta H°_f$ kcal./mole	$\Delta F°_f$ kcal./mole	$S°$ cal./deg. mole	$C°_P$ cal./deg. mole			
$Zr(BH_4)_4$					28.7	4	13
$Hf(BH_4)_4$					29	3	10

DENSITY OF LIQUID (°C)	VAPOR PRESSURE EQUATION FOR LIQUID log P_{mm} =	BOILING POINT (°C)	VAPOR PRESSURE (SLUSH BATH)	ΔH° OF VAPN. AT B.P.	ΔS° OF VAPN. AT B.P.	REMARKS
	-2039/T + 8.032 H1	123 H1				
	-2097/T + 8.274 H1	118 H1				

COMPOUND	THERMODYNAMIC FUNCTIONS AT 25°C				MELTING POINT °C	ΔH° OF FUSION kcal./mole	ΔS° OF FUSION cal./deg. mole
	ΔH°_f kcal./mole	ΔF°_f kcal./mole	S° cal./deg. mole	C°_p cal./deg. mole			
SiH_4	7.3 G2	calc	48.7	10.24	-184.7	0.159	1.80
Si_2H_6	17.1 G2				-132		
Si_3H_8					-117		
Si_4H_{10}					-84.3		
SiD_4					-186.42 A4		
Si_2D_6					-132.9 A4		
Si_3D_8					-116.9 A4		
Si_4D_{10}					-82.3 A4		
Si_2H_6O disiloxane					-144		
SiH_3F							
SiH_2F_2					-122	1	7
$SiHF_3$					-131.3		

DENSITY OF LIQUID (°C)	VAPOR PRESSURE EQUATION FOR LIQUID log P_{mm} =	BOILING POINT (°C)	VAPOR PRESSURE (SLUSH BATH)	ΔH° OF VAPN. AT B.P.	ΔS° OF VAPN. AT B.P.	REMARKS
0.68(-185°) I1	-645.9/T + 6.881 K1	-111.4	781(CS_2) F6 760(CS_2) S16	2.9	18	
0.69(-25°) I1	-1342/T + 12.918 -2.01 log T K1	-14.3		5.2	20.1	
0.725(0°) I1	-1910/T + 16.319 -3.02 log T K1	53.0	95.5(0°) S16	6.8	20.8	
0.79(0°) I1	-2594.5/T + 20.186 -4.02 log T K1	108.4	7.5(0°) S16	8.2	21.5	
		-111.6 A4				
		-15.5 A4				
	-1281.7/T + 13.7260 +9.6389 log T -0.011267T A4					
	-6011.2/T + 139.9534 -51.3041 log T +0.029211T A4					
		-15.5		5.3	20.6	
		-98		4.2	24	
		-76		3.9	20	
		-94.4		3.8	21	

COMPOUND	THERMODYNAMIC FUNCTIONS AT 25°C				MELTING POINT °C	ΔH° OF FUSION kcal./mole	ΔS° OF FUSION cal./deg. mole
	ΔH°_f kcal./mole	ΔF°_f kcal./mole	S° cal./deg. mole	C°_p cal./deg. mole			
SiH_3Cl					-118		
SiH_2Cl_2					-122		
$SiHCl_3$					-126.5		
$SiHFCl_2$					-149		
$SiHF_2Cl$					-50 P1		
SiH_3Br					-94		
SiH_2Br_2					-70		
$SiHBr_3$					-73		
Si_2H_5Br					-100		
SiH_3I					-57		
SiH_2I_2					-1		
$SiHI_3$					8		
Si_3HgN trisilylamine					-105.6		
SiH_3PH_2					< -135 F5		

DENSITY OF LIQUID (°C)	VAPOR PRESSURE EQUATION FOR LIQUID log P_{mm} =	BOILING POINT (°C)	VAPOR PRESSURE (SLUSH BATH)	ΔH° OF VAPN. AT B.P.	ΔS° OF VAPN. AT B.P.	REMARKS
		-30.4		5.1	21.0	
1.42(-122°) P1		8.3		6.0	21.3	
		31.7		6.35	20.83	
		-18.7		4.8	18.9	
		1.9	710(0°) S1	5.8	21.1	
2.14(0°) P1		13.6		7.5	26.2	
		112.2		8.1	21.0	
		-30*		7	29	*10 mm.
2.0718 (1-0.00204t) E1		45.6		6.9	21.6	
2.7943 (1-0.00320t) E1		150		8.8	20.8	
		127*		15	38	*45 mm.
		-1.8*	109(0°) S2	6.8	25.1	*100 mm. For spectrum, see R1
		12.7 F5	487(0°) F5			

COMPOUND	THERMODYNAMIC FUNCTIONS AT 25°C				MELTING POINT °C	$\Delta H°$ OF FUSION kcal./mole	$\Delta S°$ OF FUSION cal./deg. mole
	$\Delta H°_f$ kcal./mole	$\Delta F°_f$ kcal./mole	$S°$ cal./deg. mole	$C°_p$ cal./deg. mole			
GeH_4	21.6 G2		51.21	10.76	-165.90	0.200	1.86
$Ge_2H_6(g)$	38.7 G2				-109		
Ge_3H_8					-105		
Ge_4H_{10}							
Ge_5H_{12}							
GeD_4					-166.2 Z1		
Ge_2D_6					-107.9 Z1		
Ge_3D_8					-100.3 Z1		
$GeHCl_3$					-71		
GeH_3I					-15.2 S3		
GeH_2I_2					45-50 d. S3		
$(GeH_3)_2S$					-34 S3		
SnH_4	38.9 G2				-150		
Sn_2H_6							

DENSITY OF LIQUID (°C)	VAPOR PRESSURE EQUATION FOR LIQUID $\log P_{mm}$ =	BOILING POINT (°C)	VAPOR PRESSURE (SLUSH BATH)	ΔH° OF VAPN. AT B.P.	ΔS° OF VAPN. AT B.P.	REMARKS
1.523(-142°) I1	-782.5/T + 7.134 K1	-88.36	182(CS_2) F6	3.361	18.19	
1.98(-109°) I1	-1556/T + 12.986 -2.0 log T K1	30.8	243(0°) D2	6.0	19.8	see D1 for I.R. spectrum
2.20(-105°) I1	-2153/T + 16.286 -3.02 log T K1	111.1	~ 11(0°) D2	7.7	20.0	
	-1714.6/T + 6.692 A3	176.9 A3	~ 2.6(0°) A3	7.8 A3	17 A3	
	-1805.8/T + 6.449 A3	234 A3		8.3 A3	16 A3	
1.684(-160.5°) Z1	-818.4/T + 7.327 Z1	-89.2 Z1		3.744 Z1		
2.184(-106.4°) Z1	-1417.0/T + 7.579 Z1	28.4 Z1		6.483 Z1		
2.618(-99.9°) Z1	-1721.5/T + 7.367 Z1	110.5 Z1		7.876 Z1		
		75.3		8.2	23.5	
			20(0°) S3			
			5.0(0°) S3			
	-966/T + 7.257 K1	-51.8	17.5(CS_2) G2 18.5(CS_2) F6	4.4	19.9	See W2 for I.R. spectrum of $SnHD_3$
						For I.R. spectrum, see J

COMPOUND	THERMODYNAMIC FUNCTIONS AT 25°C				MELTING POINT °C	$\Delta H°$ OF FUSION kcal./mole	$\Delta S°$ OF FUSION cal./deg. mole
	$\Delta H°_f$ kcal./mole	$\Delta F°_f$ kcal./mole	$S°$ cal./deg. mole	$C°_p$ cal./deg. mole			

DENSITY OF LIQUID (°C)	VAPOR PRESSURE EQUATION FOR LIQUID $\log P_{mm} =$	BOILING POINT (°C)	VAPOR PRESSURE (SLUSH BATH)	$\Delta H°$ OF VAPN. AT B.P.	$\Delta S°$ OF VAPN. AT B.P.	REMARKS

COMPOUND	THERMODYNAMIC FUNCTIONS AT 25°C				MELTING POINT °C	ΔH° OF FUSION kcal./mole	ΔS° OF FUSION cal./deg. mole
	ΔH°_f kcal./mole	ΔF°_f kcal./mole	S° cal./deg. mole	C°_p cal./deg. mole			
NH(g)	77 A1						
NH_2(g)	41 A1						
NH_3(g)	-11.04	-3.976	46.01	8.523	-77.76	1.351	6.914
N_2H_4 (ℓ)	12.00 A2	35.61 A2	29.01 A2	23.62 A2	2.0 A2	3.025 A2	
HN_3(ℓ)	63.2 C	78.3 C	34 C		-80		
HN_3(g)	7.03	78.5	56.74	10.02			

DENSITY OF LIQUID (°C)	VAPOR PRESSURE EQUATION FOR LIQUID $\log P_{mm} =$	BOILING POINT (°C)	VAPOR PRESSURE (SLUSH BATH)	ΔH° OF VAPN. AT B.P.	ΔS° OF VAPN. AT B.P.	REMARKS
0.6103(20°) Y1	-1648.6068/T +12.465400 -0.01638646T $+2.403276 \times 10^{-5}T^2$ $-1.168708 \times 10^{-8}T^3$ (-77° to 70°) or -1612.500/T +11.83997 -0.012311T $+1.2521 \times 10^{-5}T^2$ (< -33°) Y1	-33.43	125.5 ($CHCl_3$) J1	5.581	23.28	See A6 or P2 for I.R. spectrum
1.0253 x (1-0.00085t)- A2	7.80687 $\frac{1680.745}{t + 227.74}$ A2	113.5 A2	2.6(0°) A2	9.76 A2	25.23 A2	See P2 for I.R. spectrum
1.126/ (1+0.0013t) G1	-1578.3/T +7.8533 +0.0567 log T G1	36	163.7(0°) G1	7.1	23	

COMPOUND	THERMODYNAMIC FUNCTIONS AT 25°C				MELTING POINT °C	ΔH° OF FUSION kcal./mole	ΔS° OF FUSION cal./deg. mole
	ΔH°_f kcal./mole	ΔF°_f kcal./mole	S° cal./deg. mole	C°_p cal./deg. mole			
$NH_2OH(c)$	-25.5				33.1		
NH_2Cl					-66		
$NHCl_2$							
NH_2F							
NHF_2					-131 K6		
$B_3N_3H_6$	see under boron compounds						
$B_3N_3H_5Cl$	" "	" "					
$B_3N_3H_5Br$	" "	" "					
$B_3N_3H_4Cl_2$	" "	" "					
$B_3N_3H_4Br_2$	" "	" "					
$BF_3 \cdot NH_3$	" "	" "					
$B_3N_3H_3Cl_3$	" "	" "					
PH_3	1.3 G2		50.2		-133.78	0.270	1.94
$P_2H_4(g)$	5.0 G2						
AsH_3	15.9 G3	26.4 G3	53.18 G3	9.207 G3	-116.93 S4	0.2857 S4	1.83 S4
SbH_3	34.7 G2		55.65 G2	9.887 G2	-88 S5		

DENSITY OF LIQUID (°C)	VAPOR PRESSURE EQUATION FOR LIQUID log P_{mm} =	BOILING POINT (°C)	VAPOR PRESSURE (SLUSH BATH)	ΔH° OF VAPN. AT B.P.	ΔS° OF VAPN. AT B.P.	REMARKS
		58*				*22 mm.
		-77*				*subl. p. = 760 mm.
	-1298/T + 8.072 K6	-23 K6		5.94 K6		For I.R. spectrum, see K
0.746(-90°) I1	-797.8/T + 7.180 K1	-87.74	171(CS_2) G2	3.49	18.82	
1.012(20°) I1	-1498/T + 7.330 E2	63.5 E2	73(0°) E2	6.89 E2	20.5 E2	
1.622(-63°) S4	-1403.32/T +29.82835 -9.45935 log T +0.008037T. S4	-62.48 S4	35(CS_2) J3	3.988 S4	18.93 S4	See L3 and T1 for I.R. spectrum
	1.48 x $10^{-5}P_{mm}$ -1446.34/T +16.0522 -3.1200 log T. B2	-18.4 B2	81($CHCl_3$) 224(C_6H_5Cl) B2	5.04 B2	19.8 B2	See A6 and S17 for I.R. spectrum

COMPOUND	THERMODYNAMIC FUNCTIONS AT 25°C				MELTING POINT °C	$\Delta H°$ OF FUSION kcal./mole	$\Delta S°$ OF FUSION cal./deg. mole
	$\Delta H°_f$ kcal./mole	$\Delta F°_f$ kcal./mole	$S°$ cal./deg. mole	$C°_p$ cal./deg. mole			

DENSITY OF LIQUID (°C)	VAPOR PRESSURE EQUATION FOR LIQUID $\log P_{mm} =$	BOILING POINT (°C)	VAPOR PRESSURE (SLUSH BATH)	$\Delta H°$ OF VAPN. AT B.P.	$\Delta S°$ OF VAPN. AT B.P.	REMARKS

COMPOUND	THERMODYNAMIC FUNCTIONS AT 25°C				MELTING POINT °C	ΔH° OF FUSION kcal./mole	ΔS° OF FUSION cal./deg. mole
	ΔH°_f kcal./mole	ΔF°_f kcal./mole	S° cal./deg. mole	C°_p cal./deg. mole			
OH(g)	10.06	8.93	43.888	7.141			
$H_2O(g)$	-57.798	-54.636	45.106	8.025	0	1.4363	5.2581
$H_2O(\ell)$	-68.317	-56.690	16.716	17.996			
HDO(g)	-58.735	-55.828	47.66	8.06			
HDO(ℓ)	-69.393	-57.926	18.95	18.85			
HTO(g)							
$D_2O(g)$	-59.563	-56.067	47.379	8.19	3.82	1.501	5.419
$D_2O(\ell)$	-70.413	-58.206	18.162	19.70			
DTO(g)							
$T_2O(g)$					4.49 J5		
$H_2O_2(g)$	-32.53 G5	-25.20 G5	55.66 G5	10.31 G5	-2.0	2.52	9.29
$H_2O_2(\ell)$	-44.87 G6			21.35 G6			
$HDO_2(g)$			57.86 G5	10.68 G5			
$D_2O_2(g)$	-34.45 G5	-26.59 G5	57.28 G5	11.14 G5	1.5 G7		
$D_2O_2(\ell)$	-46.96 G6			22.9 G6			

DENSITY OF LIQUID (°C)	VAPOR PRESSURE EQUATION FOR LIQUID log P_{mm} =	BOILING POINT (°C)	VAPOR PRESSURE (SLUSH BATH)	ΔH° OF VAPN. AT B.P.	ΔS° OF VAPN. AT B.P.	REMARKS
0.997074 (25°) I1		100		9.7171	26.040	
1.104509 (25°) K9	-2286/T + 8.986 K1	101.431 K9		9.927 K9		
		25.00*		13.0		*2.1 mm.
1.442 (20°) I1	-3563/T + 29.694 -7.04 log T K1					

COMPOUND	THERMODYNAMIC FUNCTIONS AT 25°C				MELTING POINT °C	ΔH° OF FUSION kcal./mole	ΔS° OF FUSION cal./deg. mole
	ΔH°_f kcal./mole	ΔF°_f kcal./mole	S° cal./deg. mole	C°_p cal./deg. mole			
H_2S	-4.815	-7.892	49.15	8.12	-85.53	0.568	3.03
H_2S_2	-4.21 F3			12.29 F1	-89.6 B1	1.8 B1	
H_2S_3	-3.45 F3				-53		
H_2S_4	-2.87 F3				-85 I1		
H_2S_5	-2.37 F3						
H_2S_6	-1.87 F3						
H_2S_7							
H_2S_8							
D_2S					-86.02	0.566	3.02
H_2Se	20.5		52.31 A5	8.26 A5	-65.73	0.601	2.90
H_2Te	36.9		54.69 A5	8.50 A5	-51	1.0	4.5
HDSe			54.99 A5	8.48 A5			
D_2Se			54.63 A5	8.78 A5	-66.92	0.596	2.89

DENSITY OF LIQUID (°C)	VAPOR PRESSURE EQUATION FOR LIQUID log P_{mm} =	BOILING POINT (°C)	VAPOR PRESSURE (SLUSH BATH)	ΔH° OF VAPN. AT B.P.	ΔS° OF VAPN. AT B.P.	REMARKS
0.96(-60°) I1	-1377/T + 19.076 -4.177 log T K1	-60.34		4.463	20.97	See P2 for I.R. spectrum
1.334(20°) F4	-2077/T + 9.041 K1	70.7 B1	~30(0°) B1	7.497 F2	21.9 F2	
1.491(20°) F4		69		9.327 F2	21.0 F2	
1.582(20°) F4				11.261 F2	21.9 F2	
1.644(20°) F4				13.340 F2	23.9 F2	
1.688(20°) F4						
1.721(20°) F4						
1.747(20°) F4						
2.12(-42°) I1	-1067/T + 7.482 K1	-41.3		4.62	19.93	
2.57(-20°) I1	-1235/T + 7.441 K1	-2.3		5.55	20.49	

COMPOUND	THERMODYNAMIC FUNCTIONS AT 25°C				MELTING POINT °C	$\Delta H°$ OF FUSION kcal./mole	$\Delta S°$ OF FUSION cal./deg. mole
	$\Delta H°_f$ kcal./mole	$\Delta F°_f$ kcal./mole	$S°$ cal./deg. mole	$C°_p$ cal./deg. mole			

DENSITY OF LIQUID (°C)	VAPOR PRESSURE EQUATION FOR LIQUID $\log P_{mm} =$	BOILING POINT (°C)	VAPOR PRESSURE (SLUSH BATH)	$\Delta H°$ OF VAPN. AT B.P.	$\Delta S°$ OF VAPN. AT B.P.	REMARKS

COMPOUND	THERMODYNAMIC FUNCTIONS AT 25°C				MELTING POINT °C	ΔH° OF FUSION kcal./mole	ΔS° OF FUSION cal./deg. mole
	ΔH°_f kcal./mole	ΔF°_f kcal./mole	S° cal./deg. mole	C°_p cal./deg. mole			
HF	-64.2	-64.7	41.47	6.95	-83.07	1.094	5.756
DF							
$(HF)_6$	-426.0						
HCl	-22.063	-22.769	44.617	6.96	-114.22	0.476	2.99
DCl					-114.75 A4		
HBr	-8.66	-12.72	47.437	6.96	-86.82	0.575	3.09
DBr					-87.48 A4		
HI	6.20	0.31	49.314	6.97	-50.80	0.686	3.08
DI					-51.88 A4		

DENSITY OF LIQUID (°C)	VAPOR PRESSURE EQUATION FOR LIQUID log P_{mm} =	BOILING POINT (°C)	VAPOR PRESSURE (SLUSH BATH)	ΔH° OF VAPN. AT B.P.	ΔS° OF VAPN. AT B.P.	REMARKS
1.0020 -0.0022625t +0.0$_5$3125t^2 S7	-1316.79/T + 7.3739 S7	19.9		1.8	6.1	
	-1261.16/T + 7.2026 S7	18.66 A4				
1.194(-85.8°) I1	-1158.5/T +17.080-3.534 log T K1	-85.05		3.86	20.5	See A6 or P2 for I.R. spectrum
		-84.85				
2.16(-68°) I1	-1290/T + 17.653 -3.679 log T K1	-66.73		4.210	20.39	See P2 for I.R. spectrum
		-66.7 A4				
2.847(-4.7°) I1	-1456/T + 17.740 -3.764 log T K1	-35.36		4.724	19.86	
		-35.86 A4				

COMPOUND	THERMODYNAMIC FUNCTIONS AT 25°C				MELTING POINT °C	$\Delta H°$ OF FUSION kcal./mole	$\Delta S°$ OF FUSION cal./deg. mole
	$\Delta H°_f$ kcal./mole	$\Delta F°_f$ kcal./mole	$S°$ cal./deg. mole	$C°_p$ cal./deg. mole			

DENSITY OF LIQUID (°C)	VAPOR PRESSURE EQUATION FOR LIQUID $\log P_{mm} =$	BOILING POINT (°C)	VAPOR PRESSURE (SLUSH BATH)	$\Delta H°$ OF VAPN. AT B.P.	$\Delta S°$ OF VAPN. AT B.P.	REMARKS

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