ref)	ē.																																Į.
Si <sub>1</sub> (ref)	$p^* = 0.1 \text{ MPa}$	log K <sub>r</sub>	ರರದ	o'	o o c	် ဝ	ರ ರ	00	o o	00	ဝံ ဝံ		000	jo	ರೆ ರ	<b>500</b>	000	ಶರರ	óó	ರರರ	GAS	oo	ooo	် ဝင်	ಶರರ	ဝဝ	600	00	ರ ರ	ರರರ	00	ರರರ	urch 1967 (
		δ.	ರರಂ	ö	ರರ	i ဝ	ರರ	o o	00	00	၁ ဝ	CRYSTAL <> LIQUID TRANSITION	ರರ	ာ်ဝံ	o o o	ಶರರ	ÖÖ	ಶರರ	ಠಠ	ರರರ	LIQUID <> IDEAL FUGACITY = 1 1	oo	000	်ဝံ	ಶರ	ರ ರ		oo	ಠಠ	ರರರ	ರರ	ರರರ	CURRENT: March 1967 (1 bar)
	Standard State Pressure	Ι.	ರರಂದ	ď	ರರಂ	် ဝံ	ರ ರ	ರ ರ	ರರ	o o	င် ဝ	CRYST	ರರ	ာ်ဝံ	ರರ	ಶರರ	ರರ:	ಶರರ	oo	ರರರ	mon —	<b>o</b> 'o'	ರರ	် ဝံ	ಶರ	ဝဝ	idd	ರ ರ	øø	ರರದ	ರರ	ರರರ	•
		H°-H*(T,)	-3218 -2952 -1773	ó	0.037 2.159 4.435	6.812	9260	14.331 16.942	19.598	25.037 27.820	33.510	35.979	86.595 89.315	94.754	97.473	105.632	11.071	119230	124.669	130.109 132.828 135.548	135.673	522.419 524.725	527.032 529.341	533.961	538.583 540.895	543.206	547.827 550.138	552.447 554.757	557.066 559.374	561.683 563.992 566.300	568.609	573.228 575.539 577.851	
	- T, - 298.15 K	-[G*-H*(T,)]/T	33.351 20 531	18.820	18.820 19.636	23.086	24.983 26.850	28.655 30.387	32.044	35.142 36.592	39.317	40.412	43.738	48.846	51.133	55.279 57.167 58.950	60.638	63.762 65.214 66.600	67.925 69.196	70.415 71.586 72.714	22.765	76.706 80.637	84377 87.941	94590	100.673 103.526	106.264	111.422	116.199	120.639	126.747 126.744 128.647	130.489	134,005 135,683 137,312	
	mperature	{C.	3.833		18.943 25.032	34.440	38.212 41.562	44.579 47.329	49.860 52.208	54.401 56.463	58.411	61.765	93.357	96.222	97.549	101.181	103.358	106.373	108.141	109.842 110.653 111.442	221.204	221.822	888 888 888 888 888 888 888 888 888 88	224.825	28.33	226.976	228.467	228.943 229.410	229.867	230.755 231.187 231.610	232.026	232.837 233.232 233.621	) (I atm)
_	ference Te	ູ່	0. 7.268 15.636	20.000	22.050 22.250 22.250 25.050	24.154	24.803 25.359	25.874 26.338	26.778 27.196	28.033	28.870	29.225	27.18	27.1%	27.198	27.18	27.196	22.12 22.13 23.13	27.196	77.18 77.18 188.18			22 20 20 20 20 20 20 20 20 20 20 20 20 2	23.108	1212	23.108	23.104	23.096 23.092	23.089	22.086 23.086 280.22	23.091	22.18 23.13 23.13	March 1967 (1 atm)
Silicon (Si)	Enthalpy Reference Temperature	7.K	006	298.15	888	8	88	88	200	65 60 60 60 60 60 60 60 60 60 60 60 60 60	8 8	1685,000	885 885	800	2200	888	2600	888	3200	330 3400 3200	3504.616	3600	888	4 6 8 8 8	4.4.4 6004 6004	4500 4500	684 800 800 800	\$ <del>\$</del> 000 000	\$100 \$200	888 888	386	2800 2800 6000	PREVIOUS.
	<b></b>					•																											
A <sub>r</sub> = 28.0855																																	

REFERENCE STATE

K crystal
K liquid
K ideal monatomic gas 1685 3504.616 3504.616 2 2

Refer to the individual tables for details.

CURRENT: December 1966

Si <sub>1</sub> (cr)
855 Silicon (Si)
$A_{\rm r} = 28.0855$
CRYSTAL
0
Silicon (SI)

 $\Delta_t H^{\circ}(0 \text{ K}) = 0 \text{ kJ·mo}$   $\Delta_t H^{\circ}(298.15 \text{ K}) = 0 \text{ kJ·mo}$   $\Delta_{tos} H^{\circ} = 50.2 \pm 0.4 \text{ kJ·mo}$  $S^{\circ}(298.15 \text{ K}) = 18.820 \pm 0.04 \text{ J·K}^{-1} \cdot \text{mol}^{-1}$ 7tm = 1685 ± 3 K

Enthalpy of Formation

Heat Capacity and Entropy

Low temperature heat capacities are based on the precise data of Flubacher et al. (8–300 K). The entropy is obtained from the heat capacities as consistent with recent data of Keesom and Seidel (1.2–4.2 K), and Kalishe et al. (60–300 K). Earlier data have been reviewed by Hultgren et al. (60–300 K). Earlier data have been reviewed by Hultgren et al.

are obtained from a Shornate plot of the adopted low temperature heat capacities and the enthalpies reported or derived from the wor Dennison,<sup>3</sup> Kantor *et al.*, Olette,<sup>7</sup> Serebrennikov and Gel'd<sup>a</sup> and Magnus.<sup>3</sup> Discrepancies are apparent in the enthalpy data, particular the range of 370–1100 K where only the recent study of Dennison<sup>3</sup> made use of a high purity sample. Enthalpies from Dennison<sup>3</sup> join smoothly with the low temperature heat capacity but deviate increasingly at higher temperatures, being 1-2% lower than the measurements above 1000 K. The selected functions agree with Dennison³ below 600 K, with Magnus¹ from 600 to 1200 K, and with K. et al.⁵ above 1200 K. The resulting heat capacities are slightly different from those selected by Hultgren, et al., 10 the latter are High temperature studies are summarized below along with the pertinent low temperatures studies. The selected heat capacities above 3 cal-K-1-mol-1 higher at 800 K and 0.21 cal-K-1-mol-1 lower at the melting point.

Source	Method	Quantity Reported	7/K	Sample
_	Calorimetry	೮	7.7–300	Single crystal, 3mm pieces, Resistance (300 K) = 100 ohm cm, Carrier Concentration ≤10 <sup>13</sup> cm <sup>-3</sup>
7	Calorimetry	Specific Heat	12-42	
	Calorimetry	. ლ	60-300	9999%
•	Temperature Modulation	· <b>U</b> ·	300-900	Resistance (300 K) = $0.027$ ohm cm.
<b>5</b>	Drop Calorimetry	Specific Heat	273-1373	Resistance (300 K) = 107 ohm cm
•	Drop Calorimetry	Enthalpy Equation	1148-1685	"Highly purified"
1	Drop Calorimetry	Specific Enthalpy	_	99.99%
	Drop Calorimetry	Specific Enthalpy		99.3%
•	Drop Calorimetry	Specific Enthalpy	372 - 1175	99.2%

**Fusion Data** 

Refer to the liquid table for details

Sublimation Data

Refer to the ideal gas table for details.

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M. N. Serbernnikov and P. v. Gel'd, Dokl. Akad. Nauk SSSR 87, 1021 (1952).

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P. Hultgren, R. L. Orr, and K. K. Kelley, "Supplement to Selected Values of Thermodynamic Properties of Metals and Alloys," University of California, Berkeley, (1965).

T/K C; S -[G'-Ff(T <sub>i</sub> )]T H'-H(T <sub>i</sub> ) AH* AG*  100 7.268 115.65 115.46 10.138 -1.292 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	1-1000	Futhainy R.	T street	Strain Strain				To Department of		
T/K         C;         S ~ -[G^*-IF(T_i)]T         H^*-II*T;         AH*         AG*         K*           0         0         0         DNFHVITE         ~ 2.218         0         0           200         15.56         11.83         20.331         ~ 1.773         0         0           200         15.56         11.82         20.331         ~ 1.773         0         0           200         15.56         11.82         13.33         13.33         ~ 0         0           200         15.21         15.66         9.177         0         0         0           200         20.35         13.80         18.80         0         0         0           300         20.176         19.66         1.773         0         0         0           400         21.14         25.30         19.66         1.773         0         0         0           400         21.14         25.30         19.66         1.773         0         0         0         0           400         21.14         25.30         19.69         1.773         0         0         0         0         0         0         0         0	- T			J-K-'mol-		4	kf-mol-1	re riesome = 1	- U.1 M.F	-
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	mol_1	7.K	ដ	S - [G	H"(T,)]/T	$H^{\bullet}-H^{\bullet}(T_{i})$	Δ,Η•	Φ'C•	log K,	_
28.15 20000 18.820 18.820 0.07 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0		388°°	0. 7.268 15.636	0. 3.833 11.665	13.351 20.531 19.138	-3218 -2952 -1.773	ರರರ	0000	ರರರ	
300 20,050 18,944 18,70 0,007 0,0 0,0 0,0 0,0 0,0 0,0 0,0 0,		298.15	20.000	18.820	18.820	0	ံ ဝံ	ံ ဝံ	ံ ဝဲ	
400 2140 2500 2150	pacity	85	20.050	18.943	18.820	0.037	0 0	ರ	00	
450 22.803 37.160 20.355 32.83 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	당	88	22.142	25.032	19.636	2.159	်ဝံ	င်ငံ	ာ်ဝံ	_
600         24154         34440         23086         6812         0         0           700         24803         38212         25874         4579         26859         11769         0         0           900         25874         44579         26853         11769         0         0         0           1100         26778         4980         3204         1958         0         0         0           1100         26778         4980         3204         1958         0         0         0           1100         26778         4980         3204         1958         0         0         0           1100         26779         40         35.10         25.27         0         0         0           1100         26779         40         35.10         35.77         35.70         0         0           1100         28.870         36.43         35.77         35.79         0         0         0           1600         28.870         36.44         40.41         33.51         37.87         0         0         0           1685         29.70         40.42         35.37         35.41	X	\$ 8	23.330	27.680 30.110	20.385	3283 4.436	ರ ರ	ರ ರ	ರ ರ	
March   Marc	ork of	88	24.154	34.440	23.086	6.812	o'	ರ	Ö	
900 25.874 44.779 28.655 14.319 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	rdy in	88	24,803	38.212	24.983	9260	o' c	o c	o c	_
1000 26,733 47,739 30,387   16,942 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	most	8	25.874	44.579	28.655	14331	ö	ó	ံဝံ	
1100 26.778   49.860   32.044   19.598   0. 0   0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	other	<u>00</u>	26,338	47.329	30,387	16.942	oʻ	Ö	o	-
1300   27.195   53.228   53.627   25.037   0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	Cantor	81	26.778	49,860	32.044	19.598	ó	ď	ö	
1500   28.033   56.453   35.75   25.05   0.0     1500   28.451   38.411   37.952   20.564   0.0     1500   28.870   60.261   39.317   33.510   0.0     1600   28.870   60.261   39.317   33.510   0.0     1600   28.870   60.261   40.662   35.418   -50.177   0.447     1800   29.786   62.734   40.662   35.418   -50.177   0.447     1800   29.786   62.317   44.187   45.393   -40.567   63.716     2000   30.454   66.883   44.187   45.393   -40.567   63.716     2000   31.786   75.297   47.466   57.744   -47.688   15.131     2400   32.217   72.207   47.466   57.744   -47.688   25.735     2500   32.655   73.923   49.448   61.187   -47.165   23.755     2500   32.655   73.923   49.448   61.187   -47.165   23.755     2500   26.658   26.658   26.658   26.658     26.658   26.658   26.658   26.658     26.658   26.658   26.658   26.658     26.658   26.658   26.658   26.658     26.658   26.658   26.658     26.658   26.658   26.658     26.658   26.658   26.658     27.658   27.658     28.658   26.658   26.658     28.658   26.658   26.658     28.658   26.658   26.658     28.658   26.658   26.658     28.658   2	0.07	200	27.13	22.208	33.627	22.297	o' c	o' c	oʻ oʻ	_
28.451 58.411 37.952 30.644 0. 0. 28.870 60.261 39.317 33.510 0. 0. 29.225 61.765 40.412 33.579 CRYSTAL <> LIQUID 29.288 62.024 40.602 36.418 -50.177 0.447 20.105 65.317 41.839 39.58 -49.977 31.418 20.105 65.327 41.879 39.58 -49.671 61.75 20.289 65.327 44.187 45.393 -49.671 61.75 20.280 65.327 44.187 45.393 -49.671 61.75 20.280 65.327 44.187 41.290 61.243 20.247 72.600 48.456 51.545 -47.688 20.908 32.217 72.600 48.456 51.947 -47.165 20.908 32.217 72.600 48.456 61.187 -47.165 23.735		100	28.033	56.463	36.592	27.820	ó	် င	ó	
28870 60261 39317 33510 0. 0. 0. 20225 61.765 40.412 35.579 CRYSTAL <> LIQUID 20288 62.074 40.662 36.41850.177 0.447 20.708 63.710 41.839 39.28869.947 34.18 30.415 65.837 44.187 45.3936.96.73 63.75 63.75 30.418 42.187 42.3936.96.73 63.75 63.75 30.418 42.187 42.3936.96.73 63.75 31.380 31.380 49.848 61.3874.68.89 15.313 31.798 71.227 72.600 48.456 57.9454.88.89 15.098 32.217 72.600 48.456 57.9454.165 20.398 32.217 72.600 49.448 61.1874.165 22.755		1500	28.451	58.411	37.982	30.644	ö	ö	ö	_
29.225   61.765   40.412   33.579   CRYSTAL <> LIQUID   29.288   62.024   40.602   36.48  50.177   0.447     20.736   63.710   41.839   39.58  49.547   34.18     30.543   63.83   44.187   45.393  49.567   9.318     30.954   68.333   45.303   46.48  49.06   12.243     31.390   69.833   46.386   31.58  49.06   12.243     31.797   72.600   48.456   54.744  49.165   18.193     32.635   73.929   49.448   61.187  47.165   23.755     32.637   33.638   46.486   61.187  47.165     33.638   34.486   61.187  47.165     34.648   61.187  47.165   23.755     35.659   35.659   35.659   35.659     35.659   35.659   35.659   35.659     35.659   35.659   35.659   35.659     35.659   35.659   35.659   35.659     35.659   35.659   35.659   35.659     35.659   35.659   35.659     35.659   35.659   35.659     35.659   35.659   35.659     35.659   35.659   35.659     35.659   35.659   35.659     35.659   35.659   35.659     35.659   35.659   35.659     35.659   35.659   35.659     35.659   35.659   35.659     35.659   35.659   35.659     35.659   35.659		009	28.870	60,261	39.317	33,510	oʻ	o	oʻ	
29.288         6.2.024         40.662         36.418         -50.177         0.447           29.706         65.310         41.839         39.388         -49.947         3.418           20.126         65.310         41.847         45.339         -49.941         3.418           30.543         66.883         44.187         45.339         -49.961         9.318           30.962         68.383         44.187         45.339         -49.961         15.131           31.380         69.833         46.386         51.535         -48.096         15.131           31.776         77.207         47.46         57.944         -48.169         18.039           32.635         77.946         61.187         -47.165         23.755		1685,000	29.225	61.765	40.412	35.979 -	CRYSTA	<b>VV</b>	QID	_
20,706 65,710 41,839 39,368 -49,947 3,418 30,125 65,375 63,7		1700	29.288	62.024	40.602	36.418	-50.177	0.4	-0.014	
20,125 05.21, 42,139 42,459 45.05 05.15 05.15 05.15 05.25 05		98	29.706	63.710	41.839	39.368	-49.947	3.418	-0.099	
30,962 68,383 45,303 48,468 -49,006 11,243 31,380 69,833 45,356 51,555 -48,609 15,151 31,737 72,600 48,456 57,7945 -47,168 20,908 32,217 72,600 48,456 61,187 -47,165 23,755 32,635 73,923 49,448 61,187 -47,165 23,755		382	30,543	68839	44.187	45.393	-49,361	9778	-0.173	
31,380 69,833 46,386 51,385 -48,608 15,151 31,798 71,227 74,436 54,744 -48,166 18,099 32,635 73,923 49,448 61,187 -47,165 25,755		2100	30.962	68.383	45,303	48.468	-49,006	12.243	-0.305	
32.17 17.607 47.48 57.44 -47.68 18.09 32.655 73.92 49.448 61.187 -47.165 23.755 32.655 73.92 -47.68 20.098		2200	31380	69,833	46.386	51.585	-48.608	15.151	-0.360	-
32.655 713.050 49.448 61.187 -47.165 23.7355		200	31.73	15	47.430	24.744	48.18	18.039	-0.410	_
		8 8 8 8	32.635	73.923	49.448	61.187	-47.165	23.755	-0.496	
	_									_
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Silicon (Si)

PREVIOUS: December 1962

Zero by definition.

CURRENT: March 1967

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A. = 28.0855 Silicon (Si)

 $\Delta_t H^{\circ}(298.15 \text{ K}) = [48.470] \text{ kJ} \cdot \text{mol}^{-1}$   $\Delta_{\text{lu}} H^{\circ} = 50.2 \pm 0.4 \text{ kJ} \cdot \text{mol}^{-1}$ 

 $S^{\circ}(298.15 \text{ K}) = [44.460] \text{ J·K}^{-1} \cdot \text{mol}^{-1}$   $T_{\text{ta}} = 1685 \pm 3 \text{ K}$ 

Silicon (Si)

Enthalpy of Formation

LIQUID

Enthalpy data for high purity samples in quartz or vitreous silica capsules have been reported for the range 1698–1915 K by Kantor et al. and for the range 1686–1825 K by Olette. Due to the limited temperature range and the experimental uncertainty, the data do not appear to ustify more than a constant hear capacity. A value of 6.5 cal·K<sup>-1</sup>-mol<sup>-1</sup> is selected, intermediate between the values of 6.75 and 6.15 obtained The enthalpy of formation,  $\Delta_H^{A}(Si, 1, 298.15 K)$  is calculated from that of the crystal by adding  $\Delta_{tas}H^{\alpha}$  and the difference in enthalpy,  $H^{\alpha}(1685 K)-H^{\alpha}(298.15 K)$ , between the crystal and liquid. Heat Capacity and Entropy from separate experiments.

The entropy is calculated in a manner analogous to that used for the enthalpy of formation

### Fusion Data

Modern determinations of the melting point range from 1683 ± 1 to 1690 ± 4 K, the former from the specific volume study of Lucas and Urbain<sup>3</sup> and the later from the enthalpy study of Kantor et al. The selected value, T<sub>1m</sub> = 1685 K, is taken from Hullgren et al., \* who have reviewed the melting data.

The enthalpy of melting is calculated from the selected enthalpy of the crystal and the liquid enthalpy measurements of Kantor et al.! and Olette, who reported comparable values of  $\Delta_{ns}H^{\circ} = 11.95 \pm 0.18$  and  $12.095 \pm 0.1$  kcal·mol<sup>-1</sup>, respectively.

### Vaporization Data

 $T_{\text{trap}}$  is calculated as the temperature for which  $\Delta_i G^0 = 0$  for Si(I) = Si(g).  $\Delta_{\text{trap}} H^0$  is calculated as the difference between  $\Delta_i H^0$ (g) and  $\Delta_i H^0$ (I) at  $T_{\text{trap}}$ . The normal boiling for the equilibrium vapor is calculated as the temperature at which Si, Si,, and Si, attain a total pressure of 1 atm; the vapor containing 92.1%, 7.0% and 0.9% (mole) of monomer, dimer, and trimer, repectively, tetramer and high polymers, which are ignored in this calculation, are probably negligible at this temperature (~3490 K).

 E. Kantor, A. M. Kisil, and E. M. Fomichev, Ukrain. Fiz. Zhur. 5, 358 (1960).
 M. Olette, Phys. Chem. Steelmaking, Proc. Dedham, Mass. 1956, 18–26 (Pub. 1958).
 L. D. Lucas and G. Urbain, Compt. Rend. 255, 2414 (1962).
 R. Hultgren, R. L. Orr and K. K. Kelley, "Supplement to Selected Values of Thermodynamic Properties of Metals and Alloys," Univ. of California, Berkeley, (1965).

### ### ### ### ### ### ### ### ### ##	othalpy Re	ference Te	Enthalpy Reference Temperature = Tr = 298.15	T, = 298.15	×	Standard State Pressure		p* = 0.1 MPa
77.196         44.460         44.460         0         48.470         40.826           77.196         44.621         44.461         10.050         48.483         40.778           77.196         48.821         44.461         10.100         48.483         40.778           77.1196         52.452         44.772         1.410         48.888         39.467           77.1196         53.553         44.772         1.410         48.988         39.467           77.1196         53.553         44.772         1.410         48.388         39.473           77.1196         53.553         44.772         1.410         48.388         39.493           77.1196         51.511         51.00         10.511         35.11         35.11           77.1196         71.371         38.284         19.088         30.467         11.543           77.1196         71.372         38.284         19.088         30.616         11.542           77.1196         84.377         66.139         11.877         30.676         14.554           77.1196         88.339         66.378         30.417         14.544         11.542           77.1196         88.339         66.378         <	J	ะ	S -[G	-H'(T,)]T	H*-H*(T,)		Φ.	log Kr
71196         44.460         44.460         0.         48.470         40.826           71199         44.623         44.461         0.050         48.470         40.778           71199         44.623         44.461         0.050         48.431         40.778           71199         48.821         44.471         1.010         48.831         40.778           71199         51.4523         45.377         8.00         49.867         38.114           71199         51.4523         54.790         80.939         26.555           71199         71.301         54.243         10.928         80.349         26.555           71199         71.302         54.243         10.828         50.517         20.517           71196         71.302         54.243         10.828         50.517         20.517           71196         71.302         54.243         10.828         50.517         20.517           71196         86.3230         61.891         21.827         80.619         25.517           71196         86.3230         61.891         21.244         0.00         11.534           71196         86.3230         61.891         21.244         0.00	-88£							
71196         44651         44641         0.050         48,483         90,477           71196         48,821         44,772         1.410         48,888         99,467           71196         32,653         45,478         4130         49,317         35,128           71196         32,653         45,478         4130         49,317         35,138           71196         32,613         45,478         5,400         49,317         35,138           71196         71,436         36,210         16,268         90,377         21,443           71196         71,436         36,210         16,268         90,377         21,517           71196         71,436         36,218         16,268         30,377         21,517           71196         84,577         11,648         30,377         21,517           71196         84,577         36,218         30,407         11,542           71196         84,577         36,218         30,407         11,542           71196         84,577         36,618         30,407         11,542           71196         84,578         37,117	8.15	27.196	44.460	44.460	ö	48.470	40.826	-7.152
21/15/2         44.87         1.410         48.88         39.467           21/15/2         54.82         44.77         1.410         48.88         39.467           21/15/2         52.55         44.77         1.410         49.37         35.114           21/15/2         53.55         44.77         1.410         49.37         35.114           21/15/2         53.543         44.77         1.400         49.37         35.114           21/15/2         50.513         52.53         51.543         50.39         52.517           21/15/2         71.30         54.243         16.48         50.39         65.55           21/15/2         71.30         54.243         16.48         50.49         75.24           21/15/2         71.30         54.243         16.58         50.50         11.565           21/15/2         71.30         54.243         17.54         50.679         11.543           21/15/2         71.30         24.247         50.679         11.543           21/15/2         71.31         24.247         50.679         11.543           21/15/2         71.31         24.247         50.679         11.543           21/15/2 <t< th=""><th>8</th><th>27.196</th><th>44.628</th><th>44.461</th><th>0.050</th><th>48.483</th><th>40.778</th><th>-7.100</th></t<>	8	27.196	44.628	44.461	0.050	48.483	40.778	-7.100
1,11,15   1,15	88	27.18 2.18 3.18	48.821	44.792	1.410	48.808	39.467	-5.890
1,196   6,479   6,779   8,709   6,987   7,144   7,1196   6,479   6,479   6,479   7,120   7,1	888	27.19	55.655	46.478	4.130	49317	36.728	-4.263
1,100, 1,100,	3 8	70.50	17000	40 707	000	2000	22 442	7.87
27.19         71.30         54.24         11.548         50.349         25.556           27.19         71.50         54.24         16.368         50.547         20.577           27.19         71.50         56.250         11.547         20.579         11.548           27.19         82.30         61.801         21.527         50.700         14.548           27.19         82.30         66.808         30.616         85.31           27.19         82.52         65.118         20.566         50.516         11.548           27.19         81.50         65.138         32.686         50.516         11.548           27.19         91.80         66.608         30.466         50.566         85.31           27.19         91.80         66.70         31.246         0         0           27.19         91.80         66.70         31.24         0         0           27.19         91.80         66.70         31.71	38	27.18	119:19	52.059	10.929	50.139	29.517	-2203
21,195	8	27.1%	71,303	54.243	13.648	50,349	26.556	-1.734
1,100, 1,100,	88	27.1% 8.1%	74.506	56.320	16.368	50.507	23.572	-1368
7.1156 8.239 6.1891 7.126 30.009 11.530 11.5	3 8	24.17	2000	20.204	19.003	20.010	20202	-1.073
27.19         8.450         6.38         7.24         5.00         15.23           27.19         8.652         6.5118         2.956         30.616         8.534           27.19         8.652         6.5118         2.956         30.616         8.534           27.19         8.252         6.5118         2.956         30.616         8.534           27.19         9.152         69.178         31.717	3 8	27.72	45.5	66.139	71807	20.679	827	-0.834
17.196   8.525   6.518   25.966   50.616   8.534     17.196   91.852   6.518   31.405   50.515   55.311     17.196   91.852   69.178   31.717	38	22.5	24.50	61 548	77 74	20.00	11 547	-0.034
7.1196         88.399         66.608         31.686         50.512         5.531           7.1198         90.114         68.006         33.405         50.537         2.537           7.1196         91.152         69.178         33.417	8	27.18	86.522	65.118	29.966	50.616	8534	-0318
7.1196         90.154         68.006         33.405         50.365         1.537           7.1196         91.552         69.178         37.717	8	27.196	88.399	809.99	32.686	50.512	5.531	-0.193
27.196         91.562         69.178         37.717         CRYSTAL <> LIQUID           27.196         93.150         69.376         38.125         0         0           27.196         94.827         71.899         45.544         0         0           27.196         94.827         71.899         45.544         0         0           27.196         98.814         75.304         31.723         0         0         0           27.196         100.0023         75.334         51.723         0         0         0         0           27.196         100.181         77.363         57.162         0	8	27.1%	90.154	68.026	35.405	50.365	2.537	-0.083
27.156         91.803         69.376         38.125         0           27.196         94.827         70.666         40.844         0         0           27.196         94.827         71.899         45.564         0         0           27.196         94.827         73.481         46.284         0         0           27.196         98.814         73.304         31.723         0         0           27.196         100.181         73.304         35.842         0         0           27.196         101.81         73.304         35.820         0         0           27.196         101.81         73.304         35.821         0         0           27.196         101.81         73.304         35.821         0         0           27.196         102.371         81.073         80.90         0         0           27.196         103.327         87.304         0         0         0           27.196         106.337         81.073         81.538         0         0         0           27.196         108.327         77.400         0         0         0         0           27.196         <	2000	27.196	91.562	69.178	37.717	CRYSTA	ļ	OID
27.15         91.20         92.16         92.17 <th< td=""><th>8</th><td>201.10</td><td>600.10</td><td>200</td><td>90.00</td><td></td><td>· ·</td><td></td></th<>	8	201.10	600.10	200	90.00		· ·	
27.11%         94.877         17.899         47.54         0.         0.           27.19%         94.827         17.891         45.24         0.         0.           27.19%         98.814         75.344         17.72         0.         0.           27.19%         98.814         75.34         51.442         0.         0.           27.19%         10.181         77.35         51.442         0.         0.           27.19%         10.181         77.33         53.82         0.         0.           27.19%         10.1384         80.191         65.371         0.         0.           27.19%         10.348         80.191         65.371         0.         0.           27.19%         10.249         87.75         77.490         0.         0.           27.19%         10.249         87.341         77.490         0.         0.           27.19%         10.240         87.341         77.490         0.         0.           27.19%         111.442         86.552         87.07         0.         0.           27.19%         111.442         86.552         87.03         0.         0.           27.19%	38	27.7	21.803	93.70	38.12	oj c	o c	jc
77.156         96.222         71.0681         46.284         0         0           77.156         97.349         74.215         46.284         0         0           77.156         97.349         74.215         46.003         0         0           77.156         100.181         75.344         0         0         0           77.156         100.231         73.35         57.162         0         0           77.156         100.231         73.36         50.261         0         0           77.156         100.337         81.073         80.04         0         0           77.156         100.337         81.073         80.04         0         0           77.156         100.347         81.073         80.04         0         0           77.156         100.347         81.073         0         0         0           77.156         100.434         81.037         77.49         0         0           77.156         100.434         81.037         77.49         0         0           77.156         111.473         86.537         87.203         0         0           77.156         111.474	38	27.12	94877	71.890	43 564	o c	d c	o c
27.196         97.549         74.215         49.003         0.         0.           27.196         98.814         75.304         31.773         0.         0.           27.196         100.033         75.324         37.162         0.         0.           27.196         100.231         73.33         57.162         0.         0.           27.196         102.291         65.321         0.         0.           27.196         105.373         81.073         65.240         0.         0.           27.196         105.373         81.073         65.240         0.         0.           27.196         105.373         81.073         77.480         0.         0.           27.196         107.49         82.156         76.199         0.         0.           27.196         100.834         77.199         0.         0.           27.196         110.633         85.342         77.199         0.         0.           27.196         110.633         85.342         87.373         9.         0.           27.196         111.642         86.542         80.797         -184.152         10.461           27.196         111.642	8	27.1%	8222	73.081	46284	ó	်ဝံ	ó
27.196         98.814         75.304         51.772         0         0           27.196         100.023         76.333         53.442         0         0         0           27.196         101.181         73.38         53.842         0         0         0         0           27.196         101.281         73.280         65.371         0         0         0         0         0           27.196         104.384         80.191         65.371         0	8	27.196	97 549	74715	49 003		c	
27.196         100.023         76.333         53.442         0         0           27.196         101.81         77.30         62.51         0         0           27.196         102.291         78.338         79.280         62.511         0         0           27.196         106.377         81.928         66.321         0         0         0           27.196         106.377         81.973         66.321         0         0         0           27.196         106.377         81.973         70.460         0         0         0           27.196         106.377         81.973         77.460         0         0         0           27.196         108.44         81.538         77.460         0         0         0           27.196         108.42         81.142         78.919         0         0         0           27.196         108.43         85.84         84.338         0         0         0           27.196         111.478         86.539         87.201         87.841         1         0           27.196         111.478         86.539         87.204         97.841         1         1 <th>8</th> <td>27.196</td> <td>98.814</td> <td>75,304</td> <td>51.723</td> <td>ó</td> <td>ď</td> <td>ó</td>	8	27.196	98.814	75,304	51.723	ó	ď	ó
27.19         (10.21)         7.353         57.162         0           27.19         (10.23)         78.38         59.882         0         0           27.19         (10.33)         79.28         62.601         0         0         0           27.19         (10.337)         81.073         60.04         0         0         0         0           27.19         (10.337)         81.073         77.480         0         0         0         0         0           27.19         (10.34)         82.756         77.480         0 <th>8</th> <td>27.1%</td> <td>100.023</td> <td>76.353</td> <td>54.442</td> <td>oʻ.</td> <td>o'</td> <td>o'</td>	8	27.1%	100.023	76.353	54.442	oʻ.	o'	o'
2.11/2         1.12/2         1.25/2         2.55/2         0.0         0.0           2.11/2         10.334         80.191         65.31         0.0         0.0         0.0           2.11/2         10.5377         81.073         70.760         0.0         0.0         0.0         0.0           2.11/2         10.249         81.278         77.69         0.0	88	37.18	101.181	78 338	57.162	oʻ c	o c	o' c
7.1150 (10.3.35	3 8	21:17	102.201	10,300	700'65	ទំ ៤	j e	j e
27.156   105.373   10.021   10.00	38	37.18	103.358	287	62,601	ರೆಂ	o c	o c
17.196   106.217   10.249   10.249   10.249   10.249   10.249   12.756   71.440   0.0	38	3.5	105 373	81.03	17789	o c	ċc	je
27.156         (i7.24)         82.756         71.480         0         0           27.156         108.141         83.561         76.199         0         0           27.156         108.005         84.343         0         0         0           27.156         110.653         83.842         84.338         0         0         0           27.156         111.478         86.595         87.203         FUGACITY = 1 bar - 0         0           27.156         111.203         87.246         87.703         FUGACITY = 1 bar - 0           27.156         111.203         87.246         87.701        84.152         10.461           27.156         111.273         87.949         97.517         FUGACITY = 1 bar - 0         0           27.156         111.273         87.946         97.517         FUGACITY = 1 bar - 0         0           27.156         111.273         87.246         97.347         884.152         10.461           27.156         115.073         89.246         97.256         882.315         41.285           27.156         116.400         91.135         108.611         881.687         76.341           27.156	8	27.195	106 377	81928	097.07	ċ	ċ	c
27.1%         108.141         83.561         76.199         0.         0.           27.19         109.005         84.343         78.919         0.         0.           27.19         100.653         85.382         84.388         0.         0.           27.19         110.653         85.382         84.388         0.         0.           27.19         110.653         85.382         87.303	8	27.18	107.249	82.756	73,480	်ဝံ	ö	်ဝံ
27.196         109.003         84.343         78.919         0         0           27.196         109.842         85.103         81.638         0         0           27.196         111.442         86.582         87.03         0         0           27.196         111.208         87.203	8	27.196	108 141	195 18	26 190	c	· c	c
7.156 109.82 85.103 81.539 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	38	27.72	100.04	92701	2010	o c	<b>5</b> c	s c
27.156   110,523   52,112   52,113   52,113   52,113   53	38	27.78	00.00	24743	016.919	<b>.</b>	jç	o c
7.11% 111,442 86.562 87,038 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	38	32.25	110.653	85 847	84.158	d c	ó	ċ
27.196         111.478         86.535         87.203         FUGACITY - 1 bar	8	27.1%	111 442	86.562	87.078	óc	ć	ć
27.196     112.08     87.264     89.797     -384.152     10.461       27.196     112.953     87.949     97.217     -383.738     21.417       27.196     113.673     88.616     97.256     -383.738     21.417       27.196     115.073     89.904     100.676     -382.915     41.255       27.196     115.743     89.904     100.676     -382.915     41.256       27.196     115.745     90.256     103.395     -382.905     65.131       27.196     116.400     91.135     106.115     -381.637     76.034       27.196     117.040     91.135     106.115     -381.637     76.034       27.196     117.040     91.130     118.277     92.882     114.274     -380.462     108.686	4616	25.	111 478	86 505	87.703	- 1	-	-
7.156 11255 8734 9725 10571 1371 1371 1371 1371 1371 1371 1371 1	8	301.00	200	136.60	FOT 08	104.163	. 3	
27.156     113.678     88.616     95.256     -383.335     37.341       27.156     114.335     89.268     97.956     -382.915     44.295       27.156     115.073     89.904     100.676     -382.905     44.285       27.156     115.445     90.256     103.395     -382.906     65.131       27.156     116.400     91.335     106.115     -381.687     76.034       27.156     117.665     92.312     111.554     -380.871     97.811       27.156     118.277     92.882     114.274     -380.462     108.686	38	35.5	12 051	87.040	93.13	- 381 738	21.417	2020
77.195 114.385 89.268 97.956 -882.915 44.295 77.196 115.745 90.526 103.395 -882.915 44.295 77.196 116.400 91.135 106.115 -881.697 77.196 117.640 91.135 106.115 -881.697 77.196 117.640 91.135 108.814 -881.877 76.034 77.1196 118.277 92.882 114.274 -380.462 108.686	8	27.196	113.678	88.616	95 236	-383.326	32.361	-0.445
27.196     115.073     89.904     100.676     -382.565     54.218       27.196     116.404     91.135     103.395     -382.096     66.131       27.196     116.404     91.135     106.115     -381.687     76.034       27.196     117.664     91.730     108.834     -381.279     86.927       27.196     117.665     92.212     111.534     -380.871     97.811       27.196     118.277     92.882     114.274     -380.462     108.686	8	27.196	114.385	89.268	97.956	-382.915	43.295	-0.580
27.196 115.745 90.526 103.395 -382.096 65.131 27.196 116.400 91.730 108.834 -381.687 76.034 27.196 117.665 92.312 111.554 -380.871 97.811 27.196 118.277 92.882 114.274 -380.462 108.686	8	27.1%	115.073	89.904	100.676	-382.505	54.218	-0.708
27.196   116.400   91.135   106.115 - 381.687   76.034   77.034   77.034   77.034   77.034   77.034   77.034   77.034   77.034   77.196   77.034   77.196	8	27.1%	115.745	90.526	103,395	-382 096	65.131	-0.830
27.1% 117.040 91.730 108.334 - 381.279 86.977 27.1% 118.277 92.312 111.554 - 380.467 97.311 27.1% 118.277 92.882 114.274 - 380.462 108.686	8	27.196	116.400	91.135	106.115	-381.687	76.034	-0.946
27.196 118.277 92.882 114.274 -380,462 108.686	8	27.196	11,040	91.730	108.834	-381.279	86.927	-1.056
080'801 708'08'- 877811 788'76 177811 06'177	88	27.18	38	92312	11554	-380.871	11876	-1.161
	8	27.1%	118.277	92,882	114.774	-380.462	108.686	-1.262

Silicon (Si)

PREVIOUS: December 1966

Si<sub>1</sub>(cr,l)

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-H(T,) T   H'-H(T,)	Enthalpy Reference	ference T	Temperature	- T 298.15	×	Standard St.	Standard State Pressure =	p - 0.1 MPa
7. 5. TO THILLY AND THILD AND THILLY AND THILLY AND THILLY AND THILLY AND THILD AND THILLY AND THILLY AND THILD AND THILLY AND THILD A	7.0		<u>=</u>					;
1,000, 0,000,	{	5		H'(T,)]/T	$H^*-H^*(T_r)$	$\Delta_{c}H$	δĢ	log Kr
1,200   1,50	٥٥	0.	0.	INFINITE	-3.218	Ö	ö	o,
1822    15.446   19.138	38	15.636	11.665	20.531	767- -1.73	ာ်ဝ	o' o'	o' c
20,000 18320 18320 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,	250	18.221	15.446	19.138	-0.923	0	o	Ö
20050 18.943 18.820 0037 0. 21.14 20050 18.943 18.820 0037 0. 21.14 2012 19.059 11.07 4.43 18.82	298.15	20.000	18.820	18.820	ď	oʻ	oʻ	ó
11.276 22.11.2 19.069 1.072 0. 22.14.2 22.11.2 19.069 1.1072 0. 22.14.3 34.440 21.086 6812 0. 24.15.4 34.440 21.086 6812 0. 24.15.3 35.21.2 24.833 9.250 0. 25.339 41.520 28.839 11.339 0. 25.339 41.520 28.839 11.339 0. 25.339 41.520 28.839 11.039 0. 25.339 41.520 28.839 11.039 0. 25.339 41.520 28.839 11.039 0. 25.339 20.341 11.339 0. 27.150 20.235 61.765 40.412 86.187 — TRAA 2.189 20.347 40.189 89.315 0. 27.150 91.803 36.342 36.359 0. 27.150 91.803 40.342 86.389 0. 27.150 91.350 40.342 86.389 0. 27.150 91.350 40.350 0. 27.150 10.231 60.237 40.338 90.343 0. 27.150 10.231 60.237 40.338 90.343 0. 27.150 10.231 60.237 40.338 90.343 0. 27.150 10.231 60.237 11.339 0. 27.150 10.231 60.237 11.339 0. 27.150 10.231 60.239 111.371 0. 27.150 10.231 60.239 111.371 0. 27.150 10.231 60.230 111.371 0. 27.150 10.231 60.230 111.371 0. 27.150 10.231 60.230 11.379 0. 27.150 10.231 60.230 11.379 0. 27.150 10.231 60.230 11.379 0. 27.150 10.231 60.230 11.379 0. 27.150 10.231 60.230 11.379 0. 27.150 10.231 60.230 11.379 0. 27.150 10.231 60.320 11.379 0. 27.150 11.420 71.380 13.820 13.83.73 1	8	20.050	18.943	18.820	0.037	oʻ	o'	ó
12.80	550	21716	22.132	90.69	2201	o o	oʻ (	ဝံဖ
1,13,130   30,110   11,237   4456   0   24,133   34,440   24,238   9,260   0   24,133   41,542   24,833   9,260   0   25,834   41,542   24,833   9,260   0   25,834   41,542   24,833   9,260   0   25,834   41,542   24,833   9,260   0   26,718   9,280   31,204   19,598   0   0   26,718   9,280   31,204   19,598   0   0   26,718   9,240   33,147   27,237   0   0   26,441   33,147   27,237   0   0   26,441   33,147   27,237   0   0   26,441   31,922   30,644   0   0   26,441   31,922   30,644   0   0   26,441   31,922   30,644   0   0   26,441   31,922   30,644   0   0   26,441   31,932   30,644   0   0   27,196   91,327   40,412   31,510   0   0   27,196   91,833   40,412   31,510   0   0   27,196   91,833   40,412   31,513   97,734   0   0   27,196   91,833   40,333   40,333   40,333   40,334   40,334   40,334   40,334   40,334   40,334   40,334   40,334   40,334   40,334   40,334   40,334   40,334   40,334   40,334   40,334   40,334   40,334   40,344	\$	22.803	27.680	20.385	3.283	o c	je	o c
14144   14440   24.96   6.812   0.     14183   14440   24.98   9.260   0.     15139   41.562   26.850   11.769   0.     15139   41.562   26.850   11.769   0.     15139   41.562   26.850   11.769   0.     15139   41.562   26.850   11.769   0.     15139   41.562   26.850   11.769   0.     1514   44.579   28.653   11.787   0.     1516   52.208   33.627   27.227   0.     1516   52.208   33.627   27.227   0.     1516   52.208   33.627   27.227   0.     1516   52.208   33.627   27.227   0.     1516   52.208   33.627   27.227   0.     1516   52.208   33.627   27.227   0.     1516   52.208   23.57   44.12   86.187   0.     1516   52.208   23.57   44.12   86.187   0.     1516   52.208   23.57   44.12   86.187   0.     1516   52.208   23.57   44.12   86.187   0.     1516   52.208   23.57   45.38   92.034   0.     1516   52.208   23.57   63.762   10.213   0.     1516   52.208   23.57   63.762   10.213   0.     1516   52.208   23.57   63.762   10.213   0.     1516   52.208   53.270   10.213   0.     1516   52.208   53.270   10.213   0.     1516   52.208   53.270   10.213   0.     1516   52.208   53.270   10.213   0.     1516   52.208   53.270   10.213   0.     1516   52.208   53.270   10.213   0.     1517   52.208   13.573	200	23,330	30.110	21.237	4.436	öo	ó	ó
24803 85.21 24.883 9.260 0. 25.374 44.579 25.550 11.760 0. 25.378 48.500 32.044 19.580 0. 25.378 48.500 32.044 19.580 0. 25.778 48.500 32.044 19.580 0. 27.186 22.200 33.1627 22.297 0. 27.187 63.643 36.57 22.297 0. 28.633 56.463 36.57 22.297 0. 28.633 56.463 36.57 22.297 0. 28.633 56.463 36.57 22.297 0. 28.71 60.21 33.37 33.50 0. 27.186 91.502 40.412 86.187 TRAI 27.186 91.502 40.412 86.187 0. 27.186 91.502 40.412 86.187 0. 27.186 10.237 46.338 93.15 0. 27.186 10.233 60.638 111.771 0. 27.186 10.338 60.638 111.771 0. 27.186 10.338 60.638 111.771 0. 27.186 10.338 60.638 111.771 0. 27.186 10.338 60.638 111.771 0. 27.186 10.338 60.638 111.771 0. 27.186 10.338 60.638 111.771 0. 27.186 10.338 60.537 41.389 0. 27.186 10.338 60.537 46.348 10.239 11.239 0. 27.186 10.481 67.925 112.829 0. 27.186 11.442 72.744 135.548 0. 27.186 11.442 72.744 135.548 13.789 7. 27.186 11.483 75.881 13.791 0. 27.186 11.483 75.881 13.791 0. 27.186 11.573 77.787 149.146 -383.295 7. 27.186 11.573 77.787 149.146 -383.295 7. 27.186 11.578 75.881 15.730 -383.295 7. 27.186 11.578 75.881 15.730 -383.295 7. 27.186 11.578 75.881 15.730 -383.295 7. 27.186 11.578 75.881 15.730 -383.295 7. 27.186 11.578 75.881 15.730 -383.295 7. 27.186 11.578 75.881 16.274 -380.462 7. 27.186 11.578 80.482 15.730 -383.295 7. 27.186 11.578 80.482 15.730 -383.295 7. 27.186 11.578 75.781 16.2744 -380.462 7. 27.186 11.578 80.482 15.730 -383.295 7. 27.186 11.578 80.482 15.730 -383.295 7. 27.186 11.578 80.482 15.730 -383.295 7. 27.186 11.578 80.482 15.730 -383.295 7. 27.186 11.578 80.482 15.730 -383.295 7. 27.186 11.578 80.482 15.730 -383.295 7. 27.186 11.578 80.482 15.730 -383.295 7. 27.186 11.578 80.482 15.730 -383.295 7. 27.186 11.578 80.482 15.730 -383.295 7. 27.186 11.578 80.482 15.730 -383.295 7. 27.186 11.578 80.482 15.730 -383.295 7. 27.186 11.578 80.482 15.730 -383.295 7. 27.186 11.578 80.482 15.730 -383.295 7. 27.186 11.578 80.482 15.730 -383.295 7. 27.186 11.578 80.482 15.730 -383.295 7. 27.186 11.578 80.482 15.730 -383.295 7. 27.186 11.578 80.482 15.730 -383.295 7. 27	8	24.154	34.440	23.086	6.812	ó	oʻ	ó
25.274 44.792 28.653 14.7169 0. 25.338 47.379 28.653 14.7169 0. 25.338 47.379 33.877 16.942 0. 25.7164 54.401 33.547 27.277 0. 27.164 54.401 33.547 27.277 0. 27.164 54.401 33.547 27.277 0. 27.164 54.401 33.547 27.277 0. 27.165 10.263 44.11 33.510 0. 27.176 91.562 40.412 33.579 0. 27.185 91.803 46.84 40.412 33.579 0. 27.185 91.803 46.84 80.316 0. 27.185 91.803 46.84 94.74 0. 27.185 91.803 46.84 94.74 0. 27.185 91.804 91.307 0. 27.185 91.307 91.307 91.307 0. 27.185 91.307 9	88	24.803	38.212	24.983	9.260	o'	oʻ.	Ö
26.733 47.279 26.375 16.942 0.  26.773 49.860 31.044 19.589 0.  27.1154 54.401 35.147 22.277 0.  27.1154 54.401 35.147 22.277 0.  28.451 36.453 36.592 21.287 0.  28.451 36.453 36.592 31.64 0.  28.451 36.453 36.592 31.64 0.  28.451 36.453 36.592 31.64 0.  28.451 36.453 36.592 31.64 0.  27.1156 91.853 40.412 86.187  0.  27.1156 91.853 40.412 86.187  0.  27.1156 91.853 40.853 92.034 0.  27.1156 90.223 45.348 92.034 0.  27.1156 10.223 11.133 97.473 0.  27.1156 10.223 11.133 97.473 0.  27.1156 10.223 11.137 97.473 0.  27.1156 10.223 11.137 97.473 0.  27.1156 10.223 11.137 97.473 0.  27.1156 10.223 11.137 97.473 0.  27.1156 10.223 11.137 97.473 0.  27.1156 10.223 11.137 0.  27.1156 10.223 11.137 0.  27.1156 10.223 11.137 0.  27.1156 10.223 11.137 0.  27.1156 10.223 11.137 0.  27.1156 10.223 11.137 0.  27.1156 10.223 11.137 0.  27.1156 11.478 7.276 11.137 0.  27.1156 11.478 7.276 11.137 0.  27.1156 11.238 7.246 11.35.43 FUGACT 11.257 0.  27.1156 11.238 7.246 11.35.43 FUGACT 11.257 0.  27.1156 11.238 7.248 14.0587 -382.295 1.  27.1156 11.243 7.7787 14.14.4 135.43 FUGACT 11.246 0.  27.1156 11.243 7.7787 14.14.4 135.43382.295 1.  27.1156 11.243 7.7787 14.14.4 135.43382.295 1.  27.1156 11.243 7.7787 14.14.4 13.564 -382.295 1.  27.1156 11.243 7.7787 14.14.4 13.564 -382.295 1.  27.1156 11.243 7.7787 14.14.4 13.564 -382.295 1.  27.1156 11.243 7.7787 14.14.4 13.564 -382.295 1.  27.1156 11.245 80.245 11.2469 1.2469 1.2469 1.2469 1.257.246 1.257.24 1.350.462 1.257.24	88	25,000	41.502	70,550	9:	o' c	oʻ (	oʻ (
26.778         49.860         32.044         19.59         0           77.1196         22.208         33.627         22.297         0           77.1196         22.208         33.647         22.297         0           28.033         56.463         36.592         27.227         0           28.033         56.463         36.592         27.820         0           28.034         60.561         39.317         33.509         0           27.186         91.803         40.842         86.187         TRAA           27.186         91.803         40.842         86.187         TRAA           27.186         94.827         40.412         86.187         TRAA           27.186         94.827         40.412         86.187         TRAA           27.186         94.827         40.348         92.034         0           27.186         100.223         100.193         0         0           27.186         100.231         60.563         111.791         0           27.186         100.231         60.563         111.791         0           27.186         100.231         60.563         111.791         0           <	88	26.338	47329	30.387	16.947	o c	<b>5</b> C	o' c
11.156   12.208   31.527   10.     12.154   12.208   31.527   10.     12.154   12.208   31.527   10.     12.154   12.208   36.44   10.     12.155   11.55   40.412   36.99   10.     12.155   11.55   40.412   35.99   10.     12.155   11.55   40.412   35.99   10.     12.155   11.55   40.412   35.99   10.     12.155   11.55   40.412   35.99   10.     12.155   11.55   40.412   35.99   10.     12.155   11.55   40.412   35.99   10.     12.155   10.203   40.864   86.595   0.     12.155   10.203   40.864   86.595   0.     12.155   10.203   40.864   40.474   0.     12.155   10.203   10.193   0.     12.155   10.203   10.293   0.     12.155   10.233   60.638   111.071   0.     12.155   10.233   60.638   111.071   0.     12.155   10.233   60.638   111.071   0.     12.195   10.233   60.638   111.071   0.     12.195   10.233   60.638   111.071   0.     12.195   10.233   60.532   113.791   0.     12.195   10.233   60.532   113.791   0.     12.195   10.233   12.266   12.1339   0.     12.195   11.423   12.248   14.377   -383.738     12.195   11.208   13.860   13.8261   -383.295     12.195   11.208   12.386   14.377   -383.295     12.195   11.208   12.268   13.793   -382.295     12.195   11.208   12.268   13.793   -382.295     12.195   11.208   12.268   13.793   -382.295     12.195   11.208   12.268   13.793   -382.295     12.195   11.208   12.268   13.793   -382.295     12.195   11.208   12.268   13.793   -382.295     12.195   11.208   12.268   13.793   -382.295     12.195   11.208   13.827   13.828   -382.295     12.195   11.208   13.268   13.793   -382.295     12.195   11.208   13.828   13.793   -382.295     12.195   11.208   13.828   13.793   -382.295     12.195   11.208   13.828   13.828   -382.295     12.195   11.208   13.828   13.828   -382.295     12.195   11.208   13.828   13.828   -382.295     12.195   11.208   13.828   13.828   13.744   -382.295     12.195   11.208   13.828   13.828   13.828   13.828   13.828   13.828   13.828   13.828   13.828   13.828   13.828   13.828   13.828   13.828   13.828   13.828   13.828	0011	26.778	49.860	32 044	10 508	; c	; c	; c
25.614   34.40  33.142   25.037   0.     28.45  58.440  33.142   25.037   0.     28.45  58.440  33.142   33.50  0.     28.45  58.440  33.142   33.50  0.     28.45  60.26  33.37  33.510   0.     27.156 91.362 40.412 86.159	1200	27.13	\$2.208	33.627	22.23	ó	o c	ď
28.453 56.463 36.592 77820 0. 28.451 56.463 36.592 77820 0. 28.870 60.261 39.317 33.510 0. 27.196 91.50 40.412 86.187 — RRAL C. 1.196 90.337 43.738 89.315 0. 27.196 91.50 40.412 86.187 — RAL C. 1.196 90.337 43.738 89.315 0. 27.196 90.337 43.738 90.314 0. 27.196 90.232 46.389 91.133 97.473 0. 27.196 10.231 85.200 10.2527 0. 27.196 10.231 85.200 10.2527 0. 27.196 10.231 85.200 10.2527 0. 27.196 10.231 85.200 10.231 0. 27.196 10.231 85.200 10.231 0. 27.196 10.231 85.200 10.231 0. 27.196 10.231 85.200 10.231 0. 27.196 10.231 85.200 11.230 0. 27.196 10.232 11.1379 0. 27.196 10.233 15.86 0. 27.196 11.208 73.880 13.283 0. 27.196 11.208 73.880 13.283 0. 27.196 11.208 73.880 13.543 FUGACT 13.593 77.787 149.146 -382.291 77.196 11.208 73.880 14.426 -382.291 77.196 11.208 73.890 18.257 -381.738 77.196 11.208 73.890 18.257 -381.738 77.196 11.208 73.890 18.257 -381.295 77.196 11.208 80.438 14.208 -382.291 77.196 11.208 80.438 14.208 -382.291 77.196 11.208 80.438 14.208 -382.291 77.196 11.208 80.438 14.208 -382.291 77.196 11.208 80.438 14.208 -382.291 77.196 11.208 80.438 14.208 -382.291 77.196 11.208 80.438 14.208 -382.291 77.196 11.208 80.438 14.208 -382.291 77.196 11.208 80.438 14.208 -382.291 77.196 11.208 80.438 14.208 -382.291 77.196 11.208 80.438 14.208 -382.291 77.196 11.208 80.438 14.208 -382.291 77.196 11.208 80.438 14.208 -382.291 77.196 11.208 80.438 14.208 -382.291 77.196 11.208 80.438 14.208 -382.291 77.196 11.208 80.438 14.208 -382.291 77.196 11.208 80.438 14.208 -382.291 77.196 11.208 80.438 80.438 80.298 17.208 -382.291 77.196 11.208 80.438 80.438 80.438 80.438 80.298 80	1300	27.614	54.401	35.142	25.037	o	ó	ó
29.225 61.765 40.412 31.500 0. 29.225 61.765 40.412 31.500 0. 27.196 91.562 40.412 86.187 TRAA 27.196 91.562 40.412 86.187 TRAA 27.196 91.562 40.412 86.187 TRAA 27.196 91.562 40.412 86.187 0. 27.196 91.562 40.412 86.187 0. 27.196 91.562 40.412 86.187 0. 27.196 91.562 40.412 80.187 0. 27.196 100.023 51.779 100.193 0. 27.196 100.181 57.167 100.193 0. 27.196 100.181 57.167 100.193 0. 27.196 100.181 57.167 100.193 0. 27.196 100.181 57.167 100.193 0. 27.196 100.181 65.104 0. 27.196 100.181 65.104 11.791 0. 27.196 100.183 66.196 11.1979 0. 27.196 100.523 11.546 0. 27.196 11.208 71.586 11.208 0. 27.196 11.208 71.586 11.208 0. 27.196 11.208 71.586 11.208 0. 27.196 11.208 71.586 11.587 FUGACT 11.571 11.5	85	28.033	56.463	36.592	27.820	o o	oʻ (	Ö
20,203   0,000   0,0	8 9	10.00	10000	70576	40.00	<b>.</b>	oʻ (	o ·
27.15   0.15   0.441   0.571A   0.571A   0.571B   0.571	000	0.000	107.00	115.65	33.210	o i	o .	
77.196         91.803         40.864         86.595         0.           77.196         93.357         43.738         89.315         0.           77.196         93.357         43.738         99.315         0.           77.196         96.222         46.846         94.734         0.           77.196         97.291         46.389         97.034         0.           77.196         100.231         53.277         100.193         0.           77.196         100.231         80.638         111.071         0.           77.196         100.333         60.538         111.071         0.           77.196         100.333         60.538         111.071         0.           77.196         100.333         60.538         111.071         0.           77.196         100.338         60.531         119.230         0.           77.196         100.340         66.000         111.920         0.           77.196         100.430         70.416         10.200         0.           77.196         111.478         72.764         135.53	1685.000	13.15	91.762	40.412	35.979	- CRYST	AL <> LIQ	95
27.196         91337         45773         89315         0.           27.196         94827         4538         92034         0.           27.196         97.549         13.133         97473         0.           27.196         100.023         53.279         100.193         0.           27.196         100.023         53.279         100.193         0.           27.196         100.181         57.167         105.622         0.           27.196         100.233         60.538         111.071         0.           27.196         100.2343         60.523         111.771         0.           27.196         100.2343         60.762         116.511         0.           27.196         100.343         60.762         116.511         0.           27.196         100.343         60.762         116.511         0.           27.196         100.342         60.762         116.511         0.           27.196         100.437         66.762         119.200         0.           27.196         100.653         71.586         110.738         0.           27.196         110.653         71.286         110.109         0.	1700	27.196	91.803	40.864	86 505	c	ionistra.	
11.195   94.827   46.348   94.734   0.     17.196   94.222   44.846   94.734   0.     17.196   96.222   44.846   94.734   0.     17.196   100.231   35.277   100.193   0.     17.196   100.231   35.277   100.193   0.     17.196   100.231   35.336   100.8332   0.     17.196   100.331   65.338   111.071   0.     17.196   100.332   65.239   111.071   0.     17.196   100.337   65.239   111.071   0.     17.196   100.337   65.240   111.930   0.     17.196   100.337   65.240   111.930   0.     17.196   100.337   65.240   11.930   0.     17.196   100.337   17.848   14.950   0.     17.196   111.073   17.848   14.0597   -381.735     17.196   111.073   17.847   140.987   -381.336     17.196   111.073   17.847   140.987   -381.336     17.196   111.073   17.847   15.186   14.385   -381.287     17.196   111.073   17.87   14.146   -380.462   1.     17.196   111.073   18.277   8.2111   162.744   -380.462   1.     17.196   118.277   8.2111   162.744   -380.462   1.     17.196   118.277   8.2111   162.744   -380.462   1.     17.196   118.277   8.2111   162.744   -380.462   1.     17.196   118.277   8.2111   162.744   -380.462   1.     17.196   118.277   8.2111   162.744   -380.462   1.     17.196   118.277   8.2111   162.744   -380.462   1.     17.196   118.277   8.2111   162.744   -380.462   1.     17.196   118.277   8.2111   162.744   -380.462   1.     17.196   118.277   8.2111   162.744   -380.462   1.     17.196   118.277   8.2111   162.744   -380.462   1.     17.196   118.277   8.2111   162.744   -380.462   1.     17.196   118.277   8.2111   162.744   -380.462   1.     17.196   118.277   8.2111   162.744   -380.462   1.     17.196   118.277   8.2111   162.744   -380.462   1.     17.196   118.277   8.2111   162.744   -380.462   1.     17.196   118.277   8.2111   162.744   -380.462   1.     17.196   118.277   8.2111   162.744   -380.462   1.     17.196   118.277   8.2111   162.744   -380.462   1.     17.196   118.277   8.2111   162.744   -380.462   1.     17.197   118.285   -380.885   1.     17.196   118.277   8.2111   162.74	1800	21.08	93.357	43.738	80315	<i>i</i> c	o c	j c
7.1196         96.222         48346         94754         0           7.1196         98.813         31.133         97.473         0           7.1196         98.813         31.133         97.473         0           7.1196         100.131         31.277         100.133         0           7.1196         101.281         71.167         10.55.37         0           7.1196         103.338         60.638         111.071         0           7.1196         104.348         60.538         111.071         0           7.1196         106.377         65.762         116.511         0           7.1196         106.373         65.762         116.511         0           7.1196         107.249         66.600         121.920         0           7.1196         106.373         65.214         119.200         0           7.1196         106.637         12.1869         0         0           7.1196         110.653         11.286         12.1869         0           7.1196         110.653         17.186         13.573         0           7.1196         111.478         72.764         135.573         0	061	27.18	94.827	46.388	92.034	ö	ó	ö
7.196         97.549         51.113         97.473         0.           7.196         100.023         53.272         100.193         0.           7.196         100.218         53.272         100.193         0.           7.196         102.218         58.250         108.322         0.           7.196         102.313         60.538         111.071         0.           7.196         103.338         60.538         111.071         0.           7.196         104.38         60.531         115.791         0.           7.196         105.373         65.16         115.79         0.           7.196         107.249         66.00         121.520         0.           7.1166         108.44         67.92         124.69         0.           7.1166         108.44         67.92         124.69         0.           7.1166         108.44         67.92         124.69         0.           7.1166         108.43         72.74         135.43	2000	21.136	96.222	48.846	94.754	ď	ö	Ö
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77.18         103.33         605.38         111.071         0           77.19         104.384         605.39         111.071         0           27.19         105.373         165.11         0         0           27.19         105.27         65.20         115.20         0           27.19         106.27         124.69         0         0           27.19         109.00         60.18         127.38         0           27.19         109.842         70.415         130.109         0           27.19         100.842         70.415         130.109         0           27.19         111.473         72.714         135.83         0           27.19         111.473         72.714         135.83         0           27.19         111.203         73.80         135.673	2500	27.1%	102.291	58.950	108.352	ď	0	o
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Z156         165.37         65.214         119.201         0.           Z1.196         106.327         65.214         119.201         0.           Z1.196         107.197         66.600         121.930         0.           Z1.196         108.141         67.925         124.669         0.           Z1.196         110.603         71.518         0.         0.           Z1.196         110.633         71.518         130.199         0.           Z1.196         110.633         71.514         135.548         0.           Z1.196         111.208         73.800         138.267         -38.132           Z1.196         113.673         748.48         14.0397         -383.36           Z1.196         113.673         748.48         14.0397         -383.36           Z1.196         113.737         748.48         14.0397         -383.36           Z1.196         115.743         77.177         141.46         -382.91           Z1.196         115.405         78.744         157.16         182.77           Z1.196         117.604         80.453         157.14         -380.462         1           Z1.196         118.277         82.111	2800	3.5	105 373	67770	113.791	o c	o o	o o
77.196         107.249         66.60         121.950         0.           77.196         108.141         67.925         124.699         0.           77.196         109.842         70.415         130.109         0.           77.196         110.633         71.518         137.839         0.           77.196         111.442         72.714         135.848         0.           77.196         111.478         72.765         135.673	2900	27.136	106.327	65.214	19230	ó	ċ	ó
77.195 108.141 67.925 124.659 0. 27.195 109.042 69.195 127.389 0. 27.195 109.053 71.586 127.839 0. 27.195 111.473 72.715 135.739 0. 27.195 111.473 72.715 135.543 0. 27.195 112.523 72.810 135.573	3000	27.1%	107.249	009:99	121.950	ó	o	ó
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7.1.96 111.478 72.765 135.673 FUGACCT 7.1.96 112.538 73.800 138.267 -384.152 77.1.96 112.573 74.848 140.987 -383.738 77.1.96 115.073 77.77 140.146 -382.915 77.1.96 115.073 77.77 149.146 -382.915 77.1.96 115.073 77.77 149.146 -382.915 77.1.96 115.073 77.77 149.146 -382.915 77.1.96 117.040 80.438 157.305 -381.687 77.1.96 118.277 82.111 162.744 -380.452 15	3200	2.18	111.442	72.714	135.548	ó	<b>.</b>	o c
27.196     112.208     73.800     138.267     -384.152       27.196     113.733     74.848     140.987     -383.738       27.196     113.733     75.840     146.426     -382.915       27.196     115.733     77.787     149.146     -382.915       27.196     115.745     78.704     151.865     -382.905       27.196     117.040     79.534     15.4585     -381.687       27.196     117.040     80.458     157.355     -381.687       27.196     117.665     81.296     160.024     -380.462       27.196     118.277     82.111     162.744     -380.462	3504.616	27.1%	111.478	72,765	135.673 -	. 1	7	- 1
7.196 112.953 748.48 140.977 -383.778 71.196 113.678 75.861 143.707 -383.326 72.196 113.678 75.861 143.707 -383.326 72.196 115.073 77.787 149.146 -382.505 72.196 115.073 77.787 149.146 -382.505 72.196 115.040 79.594 154.585 -381.296 72.196 117.040 80.458 117.305 -381.279 77.196 118.277 82.111 162.744 -380.462	3600	27.196	112,208	73.800	138 267	384.15	. 4	
77.196 113.878 75.861 143.707 -383.356 77.196 115.073 77.787 149.146 -382.505 77.196 115.745 78.704 151.865 -382.096 77.196 117.040 79.594 154.355 -381.687 77.196 117.040 80.438 157.305 -381.687 77.196 118.277 82.111 162.744 -380.462	3700	27.196	112.953	74.848	140.987	-383.738	21.417	-0302
7.1196 115.073 77.787 149.146 -382.915 77.196 115.073 77.787 149.146 -382.005 77.196 115.745 78.704 151.865 -382.006 77.196 116.740 79.534 154.585 -381.687 77.196 117.040 80.438 157.305 -381.677 77.196 118.277 82.111 162.744 -380.462	3800	27.18	113.678	75.861	143.707	-383.326	32,361	-0.445
7.156 115.745 77.167 145.146 - 382.505 77.156 115.745 78.704 151.865 - 382.505 77.156 116.400 79.594 151.865 - 381.267 77.156 117.504 80.458 157.305 - 381.277 77.156 118.277 82.111 162.744 - 380.462	986	3.5	114.385	76.840	146.426	-382.915	43.295	-0.580
77.156 115,400 79,594 154,585 -381,296 77,196 115,400 79,594 154,585 -381,297 77,196 117,645 81,296 160,024 -380,871 77,196 118,277 82,111 162,744 -380,462	3	200	270771	70.70	149.140	CDC786-	24.218	-0.708
77.156 117.040 80.458 157.355 -381.278 77.156 117.665 81.296 160.024 -380.871 77.156 118.277 82.111 162.744 -380.462	36	3.5	115.743	70.504	151,865	-382.096	65.131	-0.830
Z7.196 117.665 81.296 160.024 -380.871 27.196 118.277 82.111 102.744 -380.462	4300	27.18	17.040	80.458	157 305	180106-	16.034	-0.940
27.196 118.277 82.111 162.744 -380.462	4400	27.19	117.665	81.296	160.024	-380.871	97.811	1911
	4500	27.1%	118.277	82.111	162.744	-380.462	108,686	-1262
	0.000							
	Meracoc.						CURKE	II. Marcu 190

 $A_r = 28.0855$  Silicon (Si)

CRYSTAL-LIQUID

Refer to the individual tables for details.

0 to 1685 K crystal above 1685 K liquid

Silicon (Si)

CURRENT: March 1983 (1 bar)

<u>(S</u>
Silicon

PREVIOUS: March 1967 (1 atm)

Silicon (Si)		IDEAL GAS		A <sub>r</sub> = 28.0855 Silicon (Si)	Silicon (S	_						SI <sub>1</sub> (g)
IP(Si, g) = $65747.5 \pm 0.6$ cm <sup>-1</sup> S°(298.15 K) = $167.980 \pm 0.035$ J·K <sup>-1</sup> ·mol <sup>-1</sup>				$\Delta_t H^0(0 \text{ K}) = 446 \pm 8 \text{ kJ} \cdot \text{mol}^{-1}$ $\Delta_t H^0(298.15 \text{ K}) = 450 \pm 8 \text{ kJ} \cdot \text{mol}^{-1}$	Enthalpy Reference Temperature	eference Te	mperature	= T, = 298.15 K		Standard State Pressure = $p^* = 0.1 \text{ MPa}$ k1-mol <sup>-1</sup> .	Pressure = p	- 0.1 MPz
					7/K	ಟ	S -[G	-{G*-H*(T,)}T	$H^{\bullet}-H^{\bullet}(T_{i})$	Δ.Η.	<b>₽</b> C•	log Kr
	Electronic LA State	Electronic Levels and Quantum	n Weights		0 000	0. 28.022 23.7%	0. 140.886 158.817	INFINITE 188.980 170.054	-7550 -4809 -2247	445.668 448.142 449.526	445.668 434.437 420.095	- 226.927 - 109.718
	<sup>3</sup> Р <sub>2</sub>	00:0	2		238.15	22.52		167.980	0.164	450,000		-71.047
	ر تم	77.115	e .		88	22.24	168.117	167.980	0.041	450,004	405.252	-70.561
	جع کے	223.157	- v		38	21.613	174.417	168.843	2.229	450.071	390,317	-59.366
	2	15394.370	·		<del>2</del> 8	21.440 21.316	176.952 179.204	169.606 170.456	3.305 4.374	450.023 449.938	382.850 375.391	-44.440
Enthalpy of Formation					88	21.153	183.075	172.246	6.497	449.684	360.504	-31.385
The emplay of formation of silicon gas is chosen to be the value recommended by CODATA. This value was calculated from the sublimation and decomposition measurements of Davis et al. (1848–2003 K). Grievison and Alcock (1940–2054 K). Indicate et al. 4	osen to be the Davis et al.	ie value recomme (1848–2003 K). <sup>2</sup>	nded by COI Grievison ar	ATA. This value was calculated from the	888	20.971 20.971	189.135 191.607	175.748	12.808 14.905	448.940 448.476 447.962	330.881	-21.604 -18.349 -15.747
Gulbranson et al. (1373-1623 K), Batdorf and Smits (1493-1601 K), and Zenbov et al.	mits (1493–10	501 K), and Zenb	ov et al.		200	20.989	195.815	180.358	17.002	445.806	286.854	-13.622
Heat Capacity and Entropy The information on electronic papers levels and quantum varieties given by Moore \$9 is incomplate because more showning more showning the matrix and the contract of	ion during the	ichte given by M.	20 is 19	man les honors anomy thomas in the second	885	21.099	200.896	183.014 184.236	23,230	446.172	243.298	-10.357
levels have not been observed. Our calculations indicate that any reasonable method of filling in these missing levels (for n<11) and cutting	dicate that an	y reasonable meth	od of filling i	these missing levels (for n<11) and cutting	091	21.394	203.737	186.500	27.580	444.070	214.508	-7.003
off the summation in the partition function <sup>10</sup> has no effect on the thermodynamic functions to 6000 K. This is a result of the high energy of all levels other than those listed above; the next excited state is approximately 33326 cm <sup>-1</sup> above the ground state. Although we list only a	no effect on the xcited state is	e thermodynamic approximately 33	functions to 6 326 cm <sup>-1</sup> abo	000 K. This is a result of the high energy of ve the ground state. Although we list only a	888	21.638	206.271	188.558 189.522	29.726 31.883 34.053	393.131 392.569 392.019	200.631 189.323 178.047	-6.165 -5.494 -4.895
few levels, all levels given by Moore" and est	imated levels	(for n<11) are c	onsidered in	he calculation. The reported uncertainty is	2000		208.564	190.446	36236	391.482	166.799	-4356
3 (238.13 K) Is due to uncertainties in the relative atomic mass and the rundamental may require consideration of the excited states (for n<10) and use of different fill	atomic mass a	and the fundament use of different fi	al constants. I Il and cutoff i	constants. Extension of these calculations above 6000 K and cutoff procedures.	888		210.662	192.190	40.638	390.445	144382	-3.428
The termal functions at 298.15 K closely agree with the recent CODATA recommendations except for two minor changes. First, the entropy differs by 0.1094 J.K. <sup>-1</sup> -mol. <sup>-1</sup> because this table used a reference pressure of 1 har whereas CODATA recommendations are based	e with the rec	ent CODATA rec	commendation	numendations except for two minor changes. First, the of I have whereas CODATA recommendations are based	2500		212.597 213.511	193.014 193.811 194.581	45.08 5.08 5.08 5.08 5.08	389.444 389.454 388.974	122.056 110.924	-3.025 -2.656 -2.318
on 1 atm. Second, the entropy differs by ~0.001 J·K-1·mol-1 due to the use of slightly different values for the fundamental constants.	J·K-1-mol-1	due to the use of	slightly differ	ent values for the fundamental constants.	2600		214.393	195.326	49.575	388.503	99.812	-2.005
References	7	Ī	Č	, to on the control	7800 7800 300 300 300	22.692 22.759 28.1692	216.069 216.866 717.639	196.748 197.428 198.080	54.098 56.370 58.649	387.587 387.140 386.700	66.578 66.578 155.53	-1.148
<ol> <li>D. Cox, channal, CODALA FASA Group on Ney Yatues for Intermodynamics, J. Circin. Intermodyn. 10, 503 (1978)</li> <li>G. Davis, D. F. Anthrop, and A. W. Searcy, J. Chem. Phys. 34, 659 (1961).</li> </ol>	ney values in I. Chem. Phys	. 34, 659 (1961).		nermodyn. 10, 503 (1978).	3100		218.388	198.732	60.934	386.265	44.500	-0.750
<ol> <li>Grievesson and L. B. Alcock, in –Special Ceranics,– P. Popper, ed., Academic</li> <li>Drowart, C. DeMaria and M. Inghram, J. Chem. Phys. 29, 1015 (1958).</li> </ol>	mics,- P. Por m. Phys. 29.	per, ed., Academ 1015 (1958).	ic Press, London, (1960)	ion, (1960).	3400	22.58 22.988 22.988	219.821 220.507	199.967 200.561	65.517 67.815	385.409 384.987	22.42. 12.47. 1.486	-0.547 -0.356 -0.176
<sup>5</sup> R. A. Gulbranson, K. F. Andrew and F. A. Bvrassart, J. Electrochem. Soc. 113, 834 (1966) <sup>6</sup> D. I. Bordone and E. M. Smite, J. April Dh., 10, 250 (1968)	ssart, J. Electi	rochem. Soc. 113,	834 (1966).		3500	vò	221.174	201.141	70.116	384.568 FUGACTIY	0.507 TTY = 1 bar -	-0.008
<ol> <li>L. Datucat and F. Fr. Sullas, J. Appl. Filys. 10, 229 (1939).</li> <li>R. Zonbov, L. L. Ames and J. L. Margrave, High Temp. Sci. 5, 235 (1973).</li> </ol>	High Temp. So	ci. <b>5</b> , 235 (1973).			3600		221.822	201.706	72.419	o c		00
<ul> <li>C. E. Moore, U. S. Nat. Bur. Stand., NSRDS-NBS 34, 8 pp. (1970).</li> <li>C. E. Moore, U. S. Nat. Bur. Stand., NSRDS-NBS 3, Section 2, 11 pp. (1967).</li> </ul>	BS 34, 8 pp. ( BS 3, Section	1970). 2, 11 pp. (1967).			388	23.081	223.070	202.798	79.341	666	ರರ	000
<sup>10</sup> J. R. Downey, Jr., The Dow Chemical Company, Rept. AFOSR-TR-78-0960, Contract No. F44620-75-1-0048, (1978).	y, Rept. AFO	SR-TR-78-0960, (	Contract No. 1	:44620-75-1-0048, (1978).	8 <del>1</del> 4 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	23.13	224.875	204.346 204.840	83.961 86.272	ರ ಧರ	၁ဝဝ	တ် စံစံ
					44 4 500 64	23.13	226.925 226.457 276.976	205.324 205.799 206.264	88.583 90.895 91.706	ರರಂ	ರರಂ	ರರಂ
					946	23.108	227.484	206.719	95.517	် ဝင်	် ဝံ	3 0 0
					886	22.22	228.467 228.943	207.605	100.138	ರರರ	ಶರರ	ಶರರ
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## Enthalpy of Formation

# Heat Capacity and Entropy

### References

CURRENT: March 1983 (1 bar)

(SI*)	
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IP(Si<sup>+</sup>, g) = 131838.4  $\pm$  0.1 cm<sup>-1</sup> S°(298.15 K) = 163.426  $\pm$  0.02 J·K<sup>-1</sup>·mol<sup>-1</sup>

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## Enthalpy of Formation

 $\Delta_t H^{*}(Si^{*}, g, 0 \text{ K})$  is calculated from  $\Delta_t H^{*}(Si, g, 0 \text{ K})^{*}$  using  $\{G, mol^{-1}\}$  from  $Moore.^{2.6}$  The ionization limit is converted from is derived from the 1973 CODATA fundamental constants.<sup>3</sup> Ros and appearance potential data.

 $\Delta_H^{\bullet'}(Si^+, g, 298.15 \, K)$  is calculated from  $\Delta_H^{\bullet'}(Si, g, 0 \, K)$  by Si'(g), and e^(ref).  $\Delta_H^{\bullet'}(Si \rightarrow Si^* + e^-, 298.15 \, K)$  differs from a to threshold effects discussed by Rosenstock *et al.*  $^4\Delta_H^{\bullet'}(298.1)$ convention that excludes the enthalpy of the electron.

# Heat Capacity and Entropy

The information on electronic energy levels and quantum weig levels have not been observed. Our calculations indicate that an summation in the partition function has no effect on the thermod other than the ground state and the first four excited states; the r of these excited states has no effect on the thermodynamic function. The reported uncertainty in S°(298.15 K) is due to uncertainties is calculations above 6000 K may require consideration of the exc

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'E. R. Cohen and B. N. Taylor, J. Phys. Chem. Ref. Data 2, 653 (11'

'H. M. Rosenstock, K. Draul et al., J. Phys. Chem. Ref. Data 6, Sul'

'R. D. Levin and S. G. Lias, U. S. Nat. Bur. Stand., NSRDS–NBS–

'C. E. Moore, U. S. Nat. Bur. Stand., NSRDS–NBS–3, Section 1 (1'

'J. R. Downey, Jr., The Dow Chemical Company, AFOSR–TR–096

(SI-)	
lon,	
Silicon	

M, = 28.08605 Silicon, Ion (Si <sup>-</sup> )	Silicon, Id	(_iS) uc						Si <sub>7</sub> (g)
12.04 ± 3 kJ·mol <sup>-1</sup> [308.819] kJ·mol <sup>-1</sup>	Enthalpy R	Reference To	emperature	Enthalpy Reference Temperature = T, = 298.15 K		Standard State Pressure	e Pressure = p*	0.1 MPa
•	τÆ	ţ,	S• -[G	-[G*-H*(T,)]/T	$H^{\bullet}-H^{\bullet}(T_{*})$	1	δ <sub>C</sub> .	log Kr
	° 22 23	0. 20.786 20.786 20.786	0. 139.270 153.678 158.316	INFINITE 180.457 163.878 162.319	-6.197 -4.119 -2.040	312.037		
	298.15	20.786	161.977	161.977	0	308.819	165.272	-47.722
	388	20.786 20.786	162.106	161 <i>977</i> 162 <i>2</i> 31	0.038	308.782	272.165 266.143	-47.388 -39.720
	<del>8</del> 88	20.786 20.786 20.786	170.534	162.793 163.520 164.337	3.156 4.196	305.660 305.536 304.387	260.274 254.543 248 938	-33.988 -29.547 -26.006
$7 (133.631 \pm 0.482)$	88	20.786	176513	166.056	6.274	302.006	238.071	-20.726
lassey.	888	20.791	182.494	169.454	10.432	297.050 294.489	217.500	-14201
8.15 K), for Si <sup>-</sup> (g),	00	20.831	187.136	172.543	14.593	291.881	198.207	-10.353
be used in the ion	200	20.981	190.945	173.961 175.302 176.571	16.678	289.232 286.547 281.833	188.967 179.971	-8.973
	1868 1808	21.318	194.202	27.771 178.920	22.9%	281.094 278.335	162.638	-6.068 -5.372
ters found that the	002	21.884	197.082	180.011	27.314	275.562	146.092	-4.769
round state Si( <sup>3</sup> P <sub>0</sub> ).	0081	23.140	200.942	182.056 183.017	31.766	220.053	133.661	-3.879
states, we fiegled	2002	23.645	202,141	183.944	36.396	215.086	124,329	-3.247
	325 885 885	24.735	204.445	185.704	41.232	210.326 210.326 208.030	115.486	-2.742 -2.742 -2.526
	2400 2500	25.876 26.444	206.646	187.358	46.293 48.909	203.608	107.066	-2.152 -2.152
	2600 2700	27.002	208.762	188,923	51.581 54.309	201.483	99.015	-1.989
	2800 2800 2800 2800 2800 2800 2800 2800	28.058 28.548 35.548	210.803	190.414	59.920 59.920	197.394	91.288	-1.703 -1.577
	3100	29.428	213.730	192.530	65.719	191.629	80.222	-1,400
	3300	30.164	214.670	193.207	71.681	189.794	78.657	-1251
	3200 3200	30.475 30.748	216.498	194 <i>5</i> 24 195.164	74.714	186.229 184.492	69.696 66.294	-1.071
	3600 3700	30.982 31.180	218.255 219.107	195.794 196.412	80.862 83.970	-201.371	73.402	-1.065
	8 8 8 8 8 8	31,472	219.941 220.757 221.555	197.020 197.619 198.207	87.097 90.238 93.390	-203.906 -205.153 -206.389	88.736 96.454 104.203	-1.220 -1.292 -1.352
	4100	31,635	222.335	198.786	96.550	-207.617	111.983	-1.427
	4400 4400	31.687	224.572	199.917	102.884	-210.063 -211.284	127.632	-1.530
	4500	31.591	225.978	201.012	109.219	-212.508	143.395	-1.664
	4 80 80 80	31.521	226.657	202.075	115.536	-214,969	159.267	1.73
	200 200 200	31,336	227.967 228.599	203.105 203.609	121.823	-217.460 -218.720	175.244	-1.868
	\$200 \$200	30.369	229.216 229.819	204.105 204.593	128.067	-219.991 -221.275	191.323	-1.960
	2400 2400 2000 2000	30.83	230.467	205.075 205.549 206.017	137,337	-122.572 -223.884 -725.700	207.503	-2.045
	200	30.374	232.092	206.478	143.443	-226.552	231.957	-2.164
	8200 8200 8200 8200 8200 8200 8200 8200	29.886 29.720	23.155 23.665 24.166	207.379 207.821 208.255	149.485 152.482 155.463	-229.286 -230.679 -232.089	248.380 256.627 264.899	
	PREVIOUS:				Ì	CC	CURRENT: March 1983 (1 bar)	1983 (1 bar)

IDEAL GAS

Silicon, Ion (Si-)

 $\Delta_t H^{\circ}(0 \text{ K}) = 312.04 \pm 3 \text{ kJ} \cdot \text{m}$  $\Delta_t H^{\circ}(298.15 \text{ K}) = [308.819] \text{ kJ·m}$ 

Electonic Levels and Quantum Weights 9 9 €, cm 6952 State ت ت ت EA(Si, g) = 1.385  $\pm$  0.005 eV S°(298.15 K) = 161.977  $\pm$  0.001 J·K<sup>-1</sup>·mol<sup>-1</sup>

Enthalpy of Formation

 $\Delta_t H^2(S^1, g, 0 \text{ K})$  is calculated from  $\Delta_t H^2(S^1, g, 0 \text{ K})^4$  using the adopted electron affinity of EA(S) = 1.385 ± 0.005 eV (133.631 ± 0. kJ·mol<sup>-1</sup>). This value, recommended by Hotop and Lineberger, <sup>2</sup> is based on a laser photodetachment electron spectrometry study. <sup>3</sup> Addition information on Si<sup>-</sup>(g) may be obtained in the critical discussions of Hotop and Lineberger, <sup>2</sup> <sup>4</sup> Rosenstock *et al.* <sup>3</sup> and Massey. <sup>6</sup>

 $\Delta_t H^2(Si^-, g, 298.15 \text{ K})$  is obtained from  $\Delta_t H^2(Si, g, 0 \text{ K})$  by using EA(Si) with JANAF entralpies,  $H^2(0 \text{ K}) + H^2(298.15 \text{ K})$ , for SiSi(g), and e (ref)  $\Delta_t H^2(Si^- \to Si + e^-, 298.15 \text{ K})$  differs from a room-temperature threshold energy due to inclusion of these enthalpies to threshold effects discussed by Rosenstock *et al.*<sup>2</sup>  $\Delta_t H^2(298.15 \text{ K})$  should be changed by  $+6.197 \text{ kJ-mol}^{-1}$  if it is to be used in the convention that excludes the enthalpy of the electron.

# Heat Capacity and Entropy

Electronic energy levels are from the laser photodetachment electron spectrometry study of Kasdan et al.  $^3$  These workers found that Si<sup>-</sup>( $^4$ D) and Si<sup>-</sup>( $^4$ P) states have binding energies of 0.523  $\pm$  0.005 eV and 0.029  $\pm$  0.005 eV, respectively, relative to ground state Si( $^4$ ) The electronic energies of 6952 cm  $^{-1}$  and 10937 cm  $^{-1}$  are the difference in binding energy between ground and excited states. We neg the spin-orbit splitting of the 2D and 2P states; its effect is negligible

JANAF Thermochemical Tables: Si(g), 3-31-83; e (ref), 3-31-82.

<sup>2</sup>H. Hotop and W. C. Lineberger, J. Phys. Chem. Ref. Data, 14, 731 (1985).

A. Kasdan, E. Herbst and W. C. Lineberger, J. Chem. Phys. 62, 541 (1975).
 H. Hotop and W. C. Lineberger, J. Phys. Chem. Ref. Data 4, 539 (1975).
 H. M. Rosenstock, K. Draxl et al., J. Phys. Chem. Ref. Data 6, Supp. 1, 783 pp. (1977).
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CURRENT: March 1967 (1 bar)

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S	

6

Silicon (Si <sub>2</sub> )	A <sub>t</sub> H <sup>o</sup> (0 K) = 587.1 ± 13 kJ·mol <sup>-1</sup> Enthalpy Reference Temperature = T <sub>r</sub> = 2 (298.15 K) = 589.9 ± 13 kJ·mol <sup>-1</sup> J·K <sup>-1</sup> mol <sup>-1</sup>
M <sub>r</sub> = 56.1710 Silicon (Si <sub>2</sub> )	$\Delta_t H^{\circ}(0 \text{ K}) = 587.1 \pm 13 \text{ kJ} \cdot \text{mol}^{-1}$ $\Delta_t H^{\circ}(298.15 \text{ K}) = 589.9 \pm 13 \text{ kJ} \cdot \text{mol}^{-1}$
IDEAL GAS	ī.
Silicon (Si <sub>2</sub> )	S°(298.15 K) = 229.79 J·K <sup>-1</sup> ·mol <sup>-</sup>

Silicon (SI<sub>2</sub>)

1	š	3 6 [2]	<u>=</u> e
	€. cm <sup>-1</sup>	[30000] 30769 [40000]	(45000) 46762 0 = 2 7 = 2 246 Å
ghts	State	ĔŅĒξ	<u> </u>
ntum Weights	00	33.2	n <del>.</del>
Electronic Levels and Quantum	e, cm <sup>-1</sup>	[19000] [13000] [20000] 24583	ω.τ. = 2.02 cm <sup>-1</sup> α. = 0.0013 cm <sup>-1</sup>
Electronic	State	<u> </u>	1
	8,	3 [] [3]	_
	e, cm-1	0 [2000] [6000]	$\omega_{\rm e} = 510.98 \text{ cm}^{-1}$ $B_{\rm e} = 0.2390 \text{ cm}^{-1}$
	State	<sup>ઌ</sup> ૻ૽૽ઌ૽ૺૼૺ૽ૼ	

## Enthalpy of Formation

of the absorption spectra that  $D_0^2 = 70 \pm 4$  kcal·mol<sup>-1</sup>. Predissociation of the H state suggested the upper limit  $D_0^2 \le 74.0$ , while line Birgen-Sponer extrapolations of the H and K states gave 78.4 and 68.9 kcal·mol<sup>-1</sup> for the ground state. By assuming that the true extrapolation would not reduce the linear extrapolation for the H state by more than half, i.e. from 26 to 13 kcal-mol-1, the authors arrived at the low The selected value is based on the spectroscopic and equilibrium data summarized below. Verma and Warsop! concluded from analy limit of  $D_0^{\circ} \ge 65.5$  for the ground state.

Drowari and co-workers have used the Knudsen effusion-mass spectrometric technique to determine the vapor equilibria over the system SiC-graphite, SiC-silicon and boron-carbon-silicon. Third law analysis of the partial pressures of Si<sub>2</sub> and Si over the three systems yiek D<sub>0</sub><sup>0</sup> values of 73.3, 74.3 and 70.4 kcal-mol<sup>-1</sup>, which are in good agreement with the spectroscopic values. The selected value A<sub>4</sub>H'(298.15 K) = 141 ± 3 kcal-mol<sup>-1</sup>, corresponds to D<sub>0</sub><sup>0</sup> = 73.0 kcal-mol<sup>-1</sup>.

Source	Method	7/K	Data Points	Δ <sub>t</sub> H°(298.15 l 2nd law	Δ,H°(298.15 K), kcal·mol <sup>-1</sup> 2nd law 3rd law	Drift cal·K <sup>-1</sup> ·mol <sup>-1</sup>	Δ <sub>t</sub> H°(298.15 K) kcal·mol <sup>-1</sup>
-	Prediss. of H state		1	\$78	5.4		0.0714
	LEX of K state		1	70.7			2.54.
	Extens of U ctate				3 5		145.1
,	LAUAP. OI II SIGIC		ı	Ň	6.9		≤148.5
	Mass spec.	2149-2316	7	$95.3 \pm 7.1$	74.68	-9 +3	140.7
n ·	Mass spec.	1703-2160	6	$81.0 \pm 1.1$	75.71	-27+06	130.7
•	Mass spec.	2166-2344	4	68.0 ± 16	71.76	); ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;	1/3.6
	*For the reaction Si <sub>2</sub> (g) = 2	) = 2 Si(g)			•	. !	0.541

# Heat Capacity and Entropy

those of Douglas. Observation of the same H-X system in matrix isolation by Weltner and McLeod' confirms that the lower state is the groun state. Comparison with the isoelectronic molecules C<sub>2</sub>, BN, BeO and MgO<sup>2-10</sup> suggest that there are several possible low-lying excited state in Sis. Tentative estimates for these levels are given above, based on this comparison and on the observed states. 13 These estimates ar relatively uncertain and probably yield an upper limit for the entropy at temperatures where Si<sub>2</sub> is significant. A probable lower limit ma be obtained by increasing the two <sup>3</sup>II states by 8000 cm<sup>-1</sup> and omitting the other estimated levels. This would reduce the entropy by 1. cal. K<sup>-1</sup>mol<sup>-1</sup> at 2000 K, corresponding to a change of 3.4 kcal·mol<sup>-1</sup> in Q,H° values based on equilibrium data. Vibrational and rotational constants are those obtained by Verma and Warsop! through combination of their data for the H-X system wir

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 Drowart, G. DeMaria and M. G. Inghram, J. Chem. Phys. 29, 1015 (1958).
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E. Dorglas, Can. J. Phys. 33, 801 (1955).
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01_1 01_1	Enthalpy R	eference T	Enthalpy Reference Temperature	= T. = 29&15 K	K	Standard State	Standard State Pressure = p = 0.1 MPa	p = 0.1 MPz	
	τÆ	ಚ	S -[G	-[G*-H*(T,)]T	$H^{\bullet}-H^{\bullet}(T_t)$	-H'√	\$€	log K,	
	°88	29.412	195.317	INFINITE 258.806	-9.263	587.118 589.499	587.118 570 734	- 298.121	
	នុង	33.463	223.812	230,355	-3.278 -1.636	590.212 590.154	551.581 541.924	-144.058 -113.229	
	298.15	34.452	229.793	229.793	o	589.944	532.653	-93.319	_
	388	35,374	235,390	230.217	1811	589.934 589.611	532.298 522.716	-92.681 -78.011	
	\$\$\$	37.096	244.487	232.412	5.434	589.228 588.812	513.185	-67.015	
	8	39.743	255.574	236.860	1167	288,382	494.272	-51.636	
	88	41.286	261.770	239.981	15.252	586.675	456.933	-34.097	
	88	43.774	272.417	246.046	23.734	585.015 585.015	438.455	-28.628	
	8 8	43.738	281 183	248.916	28.087	584.146	401.801	-20.988	
ysis	88	13,63	285.008	254.284	36.869	582.220 582.219	383.611	-18216 -15.910	
ear	8	43.709	288.524	256.785 259.169	41.261 45.640	581,130	347.493	-13.962	
G 1	<u>8</u> §	43.520	294.779	261.444	20.002	578.658	311.724	-10.855	
į	88	43.135	300,202	263.616 265.692	54344 58.667	577.268 475.421	293.974	-9.597	
ms ms	<u>0</u>	42.962	302.662	267.678	62.972	474287	265.579	101.1-	
ş	2000	42.679	307.174	271.406	11.534	471.971	242.513	-6.334	
ej S	2700 2200	42.569 42.479	309.253	273.160	75.797	470.794	231.069	-5.748	
	2300	42.407	313.118	276.469	84293	468.412	208.348	-5.710	
_	2500	<b>4</b> 2317	316.650	279.544	88.531 92.764	467.210 466.004	197.067	-4289	
1	2802 2700	42.282 42.264	318,308	281.003 282.415	96.993	464.795	174.653	-3.509	
	2800 2800 2800	42.25	321.441	283.781	105.446	462.369	152.425	-2844	
	3000	47.259	324.356	286.390	113.897	459.942	141.377	-2546	
	3200	42.271	325.742	287.637	118.124	458.729	119.405	-2.012	
	3300	2307	328,386	290.028	126.581	456.308	97.590	-1.771	
	3200	42.358	330.876	292.291	130.813	455.101 453.896	86.738 75.921	-1.333 -1.133	
	3600	42.388	332.070	293.380	139.285	-315.609	86.060	-1249	
	3800	42.455	334364	295.477	147.769	-315.980	108,396	-1.373	
Ę Ę	4 600 7 8 8	42.492 42.531	335.467 336.543	296.488 297.476	152.016 156.267	-316.721 -317.090	119.578	-1.602	
ž.	65 45 45 45 45 45 45 45 45 45 45 45 45 45	42.614	337.594	298.442 299.186	160.523	-317.456	141.971	-1.809	
arc arc	6,430	42.658	339.623	300311	169.045	-318.177	164.399	- 1.997	
2.5	4200	42.751	341.565	302.101	17.586	-318.881	175.626	-2.085 -2.169	
	864 866	<b>42.8</b> 50	342.505 343.426	302.969	181.864	-319.226	198.103	-2250	
	6 6 6 6 6 6 7	42.902	344,329	304.655	190.434	-319.897	220.610	-2.401	
	2002	43.010	346.082	306.277	199.025	-320224 -320.545	231 <i>8</i> 74 243.145	-2.472	
	200 200	43.066 43.123	346.934 347.771	307.066 307.841	203,328	-320.859	254.422	-2.606	
 6	5300 5400	43.181 43.241	348.593	308.602	211.953	-321.469	276.994	-2.730	
	2200	43.302	350.195	310.086	220.601	-322.054	299.588	-2845	
	888 805 800	43.364	350.976 351.744	310.809	229.274	-322,338 -322,618	310.893	-2.900	
-	2800	43.492 43.557	352.500 353.244	312,220 312,909	233.620 237.973	-322.892 -323.162	333,519	-3.004	
	0009	43.623	353.976	313,588	242.332	-323.427	356,163	-3.101	

Silicon (Si2)

PREVIOUS: March 1967 (1 atm)

-4282 -3951 -3.646 -3.362 -3.099

213.128 204.246 195.426 186.666 177.963

444.932 443.212 441.521 439.860 438.228

436.626 435.054 433.511 431.997 430.511

354,309 356,103 357,850 359,554 361,216

410.653 412.744 414.780 416.764 418.698

65.718 66.013 66.304 66.589 66.867

2.853 2.2663 2.2673 2.207 2.207 2.208 3.103 3.103 3.103 3.103 3.103 4.20

362.839 364.425 366.475 366.497 366.976 370.825 371.855 371.248 371.248 371.248 371.248 371.276 377.276 377.276 377.276 377.276 377.276 377.276 377.276 377.276 377.276 377.276

429.396 431.045 432.660 434.242 435.792

68.330 68.535 68.727 68.908

-724.151 -724.241 -724.312 -724.363 -724.415 -724.416 -724.416 -724.416 -724.416

276.167 283.098 290.043

438.803 440.265 441.699 443.107 437.312

403.227 427.741 452.255 476.769 501.281 525.793 550.304 574.813

-724217 -724217 -724.145 -724.065 -723.976

310.949

169.314 160.717 152.06 143.665 143.665 135.206 135.206 135.707 158.713 207.158 225.163 225.163 225.163 235.713 335.723 335.230

-723.403 -723.593 -723.763 -723.913 -724.042

207.886 214.613 221.365 228.142 234.942

420,586 422,429 424,229 425,990 477,711

67.136 67.396 67.646 67.886 68.114

-6.433 -5.921 -5.455 -5.030 -4.640

453.933 452.084 450.258 448.456 446.681

333.089 335.548 340.198 344.540 344.545 346.615 350.573

399.228 401.658 404.011 406.291 408.503

313.964 286.594 286.594 277.408 267.969 249.366 240.192 231.098

-19.463 -16.992 -14.908 -13.128 -11.590 -9.113 -8.327 -7.626 -6.999

409.863 390.360 371.022 351.846 332.827

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-6.047

M <sub>r</sub> = 84.2565 Silicon (Si <sub>3</sub> )	
IDEAL GAS	

Silicon (Si3)

S"(298.15 K)

Sl<sub>3</sub>(g)

indard State Pressure =  $p^{\circ}$  = 0.1 MPa

-100.374 -99.687 -83.872 -72.017 -62.803 -55.438

572.927

-44.403 -36.537 -30.649 -26.082

510.042 489.629 469.412

-321.073 -155.066 -121.837

The contract Temperature Temperature      KK	The lease   Temperature   T, = 298,15 K   The lease   T,	9 Reference Temperature = T, = 298.15 K  C; S' - [G*-If(T <sub>1</sub> )]/T H  0 0. 0. 0. INFINITE 0 39.149 216.004 312.988 0 55.055 258.381 268.794 15 55.055 268.382 267.398 0 55.055 27.882 267.398 0 55.055 27.882 267.398 0 55.055 27.882 267.398 0 55.055 27.882 27.299 0 55.055 27.392 27.2097 0 55.055 27.392 27.2097 0 50.159 30.259 27.2097 0 61.050 33.590 29.3281 0 61.584 33.576 30.555 0 61.584 33.576 30.555 0 61.584 33.576 30.555 0 61.584 33.576 30.555 0 61.584 33.576 30.555 0 61.584 33.576 30.555 0 61.584 33.576 30.555 0 61.584 33.576 30.555 0 61.584 33.576 30.555 0 61.584 33.576 30.555 0 61.584 33.576 30.555 0 61.584 33.576 30.555 0 61.584 33.576 30.555 0 62.190 368.649 312.225 0 62.190 379.598 322.214 0 62.100 379.598 322.214	<u></u>	다. (276.13 K) = 030.0 로 42 KJ·mol	Electronic Levels and Quantum Weights State  £, cm <sup>-1</sup> 8,	3	[5]	Vilmeitand Present and Present	racies			0-[2]			
Temperature 5° - [G**]  0. [16.004]  246.896  258.381  267.898  268.39  268.39  275.896  284.50  291.359  291.500  391.500  391.600  391.500  391.500  391.500  391.500  391.500  391.500  391.500  391.500  391.500  391.500	Temperature = T <sub>r</sub> = 298.15 K   J.K <sup>-1</sup> mol <sup>-1</sup>   J.K <sup>-1</sup> m	H*-H*(T;) -12319 -9.688 -5.180 -5.180 0.0 0.102 2.899 5.761 8.673 11.620 17.593 17.593 58.44 43.84 43.84 43.84 43.88 66.695 75.111 75.111	uthalpy Reference												
	T, = 298.15 K  -ir(T <sub>1</sub> ) T  -ir	H*-H*(T;) -12.919 -9.688 -2.603 0. 0. 0.102 2.899 5.761 8.673 11.620 17.593 17.593 17.593 18.644 18.644 18.644 18.6693	Temperature =		=		268.239 276.859 284.502	291.359 297.570	308.457	333.108 339.579	345.450	355.769 360.359 364.639	368.649	375.988	505.00

### Enthalpy of Formation

The selected value is an average based on the equilibrium data summarized below. Drowart et al. have used the Knudsen effusion-mass spectrometric technique to determine the vapor species over the systems SiC-graphite¹ and SiC-silicon.2 Third law analysis of the partial pressures of Si<sub>2</sub> and Si<sub>2</sub> yields the values 154.0 and 149.9 kcal·mol<sup>-1</sup>. Both drifts suggest that the entropy may be lower than the tabulated values. It is unlikely that the entropy is in error by more than  $5 \text{ cal·K}^{-1} \text{mol}^{-1}$  so that most of the drift is inherent in the data. The adopted value of  $\Delta_t H^3(298.15 \text{ K}) = 152 \pm 10 \text{ kcal·mol}^{-1}$  includes allowance for an error of up to  $5 \text{ cal·K}^{-1} \text{mol}^{-1}$ .

			Data	Δ,Η°(298.15	4H°(298.15 K), kcal·mol <sup>-1</sup>	cal·K-1-mol-1	ΔH*(298.15 K)
Source	Method	T/K	Points	2nd law	3rd law	Drift	kcal·mol <sup>-1</sup>
-	Mass Spec.	2230-2316	2	209	169.1	-18	154.0
7	Mass Spec.	1703-1890	4	204 ± 3	173.2	$-17 \pm 2$	149.9
	*For reaction	For reaction $Si_1(g) = 3 Si(g)$					:

# Heat Capacity and Entropy

for C, and C,Si. Also a  $^{1}\Pi_{s}$  level is assumed at 10000 cm  $^{-1}$ , presumably arising from the same molecular orbital configuration as the  $^{1}\Pi_{s}$  state. The molecule is assumed to be linear with a bond distance equal to that in Si. Vibrational frequencies are estimated from a valence bond calculation using  $k_{1} = 2.16 \times 10^{5}$  and  $k_{0}/1^{2} = 0.11 \times 10^{7}$  dyn cm  $^{-1}$ . The stretching force constant is obtained from Si., while the bending force constant is based on C<sub>2</sub>Si and the  $^{1}\Pi_{s}$  excited state  $^{2}$  of C<sub>3</sub>. We there and McLeod observed an absorption band near 4660 Å in matrix isolation studies. Their tenative assignment of this band as the  $\Sigma_{\Sigma} \leftarrow \Sigma_{\Sigma}$  transition of Si, is adopted here. A 'II, state is assumed at 18000 cm<sup>-1</sup>, which is 7000 and 2000 cm<sup>-1</sup> below the analogous levels  $\Sigma_{\Sigma} \leftarrow \Sigma_{\Sigma}$  transition of Si, is adopted here. A 'II, state is assumed at 18000 cm<sup>-1</sup>, which is 7000 and 2000 cm<sup>-1</sup> below the analogous levels  $\Sigma_{\Sigma} \leftarrow \Sigma_{\Sigma}$  transition of Si, is adopted here. A 'II, state is assumed at 18000 cm<sup>-1</sup>, which is 7000 and 2000 cm<sup>-1</sup> below the analogous levels  $\Sigma_{\Sigma} \leftarrow \Sigma_{\Sigma}$  transition of Si, is adopted here.

Drowart, G. DeMaria and M. G. Inghram, J. Chem. Phys. 29, 1015 (1958).
 Drowart and G. DeMaria, pp. 16-23 in "Silicon Carbide," Edited by J. R. O'Connor and J. Smiltens, Pergamon Press, New York, (1960).
 V. Welmer, Jr. and D. McLeod, Jr., J. Chem. Phys. 41, 235 (1964); 40, 1305 (1964); 45, 3096 (1966).

CURRENT: March 1967 (1 bar) -723.885 -723.790 -723.693 -723.596 -723.596 Warch 1967 PREVIOUS: 25000 15000

Silicon (Si<sub>3</sub>)

Enthalpy Reference Temperature J:K <sup>-1</sup> mol <sup>-1</sup>	Terence T	emperature	- T, - 298.15 K		Standard Sta	Standard State Pressure = $p^{\bullet}$	- 0.1 MPa
T/K	ະ	S -{G	-[G*-H*(T,)]/T	$H^{\bullet}-H^{\bullet}(T_t)$	Δ <sub>t</sub> H•	<b>₽</b> C•	log Kr
08	0. 23.481	0.	INFINITE 78.738	-6.568	<b>o</b> o	ód	o' c
200	25.757	45.209	58.112	-2.581	Ö	0	ó
298.15	26.791	55.694	55.694	ö	o ·	o ·	o ·
88	28.62	53.839	56.757	0.050	ರ ೦	o c	oʻ c
8	28.785	70.010	58.797	2.607	ó	io	ó
9	29.814	75.349	61.122	8.536	oʻ.	Ö	ö
88	31.935	84.214	65.827	14.710	ರ ರ	ರ ರ	၁ ဝ
820.000	32.151	85.005	66.285	15.351	ALPHA	1	
820.000	29.790	86.026	66.285	16.188		TRANSITION	
88	30.55	88.814 92.010	70.393	21.618	ರ ರ	ರ ರ	ರ ರ
1050,000	30.752	93.505	71.458	23.150	BETA	V <> LIQUID	
100	39.463	102.418	72.824	10.000	c	O	
1200	39,463	105.852	75.435	36.500	ö	ö	ó
98	39.463	00.010	77.898	40.446	o c	ರ	o c
9 <u>8</u>	39.463	114.658	82.432	48,339	್ ರ	ာ်ဝ	ဝ်ဝ
1600	39.463	117.204	84.526	52.285	ö	oʻ	oʻ
1685.492	39.463	119.259	86.236	55.659	- uqui	D <> DEAL GAS	SA.
1700	20.034	200.000	87.714	103 146	2		•
1800	20.882	207.02	93.559	195,232	öö	်ဝ	ó
06 200 200 200 200 200 200 200 200 200 2	20.949 21.049	203.152	99.297 104.517	197,323	ರ ರ	o o	o o
2100	21.191	205.259	109.290	201.534	ó	ó	ó
2200	21.383	206.249	113.675	203.662	o' c	Ö	00
2400	21.959	208.132	121.469	207.992	್ ರ	်ဝံ	ó
2500	22.361	209.036	124.953	210.207	o ·	o ·	oʻ
2800	3,25	209.923	128.204	212.467	ರ ೦	o' c	oʻ c
2800	24.109	211.660	134.104	217.157	်ငံ	်ဝံ	ö
2800	24.889	212.519	136.793	219.606	o' c	o' c	o c
915	27.75	117.738	141 734	774.763	o c	<b>.</b>	<b>.</b>
3200	27.834	215.104	144.013	227.492	jo	ಶರ	် ငံ
3300	29.008	215.978	146.181	230,333	oʻ (	o ·	ö
88	31.611	217.759	150.220	236.389	ತ ರ	o d	ď
3600	33,022	218,670	152,108	239.620	Ö	Ö	ó
3700	34.493	219.594	153,920	242.995	Ö	o	Ö
96	35.011	220.534	155.660	246.520	ರ ೦	ರ	o c
4000	39.142	222.461	158.952	254.034	်ဝံ	ó	ó
4100	40.730	223.447	160.513	258.027	0'	o' c	ď
430	42.304	224.440	162.023	262.176	ರೆ೦	ರ ೦	o' c
9	45.418	226.486	164.907	270.950	ö	io	ó
4500	176.04	270 555	187.001	805.617	ತ ರ	ဝံဇ	j (
4700	49.584	229.608	168.936	285.159	ೆ ರ	ာ်ဝ	ೆರ
4800	50.884	230.665	170211	290.182	ರ	oʻ (	o' i
§ §	53.254	232.791	17.671	300.596	ರ ರ	ರ ರ	ರ ರ
200	55,250	234.914	175.024	311.429	ó	o	Ö
2400	56.945	237.032	177.282	322.655	ö	oʻ.	ó
2800	58296	239.129	179.453	334.184	o' c	o' c	o' c
3						5	5

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REFERENCE STATE

Refer to the individual tables for details.

to 820 to 1050 to 1685.492 1685.492

0 820 1050 above

Strontium (Sr)