Internally-consistent thermodynamic dataset

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In the application of equilibrium thermodynamics, we take the starting point to be what I call the "equilibrium relationship": the relationship for a balanced chemical reaction between the end-members of phases that are in equilibrium with each other:

$$0 = \Delta G^o + \mathrm{R}T \ln K \tag{1}$$

in which ΔG^o is the Gibbs energy of the reaction between the pure end-members in the same structure as the phases in which they occur, K is the equilibrium constant, in terms of the activities of the end-members in their phases, T is temperature, and R is the gas constant.

Looking at (1), the first practical concern is where we get the numbers from to insert into ΔG^o for any particular reaction. There are actually two sides to this: the form that the Gibbs energies of pure end-members should have as a function of P and T, and what the numbers are. These two go hand-in-hand, and in the context of the internally-consistent dataset that THERMOCALC uses, the papers to read are

Powell, R, and Holland, TJB, 1985 An internally consistent thermodynamic dataset with uncertainties and correlations : 1 : Methods and a worked example. *Journal of Metamorphic Geology* **3**, 327–342.

Holland, TJB, and Powell, R, 1985 An internally consistent thermodynamic dataset with uncertainties and correlations : 2 : Data and results. *Journal of Metamorphic Geology* **3**, 343–370.

Holland, TJB, and Powell, R, 1990 An enlarged and updated internally consistent thermodynamic dataset with uncertainties and correlations: the system K_2O-Na_2O-CaO-MgO-MnO-FeO-Fe_2O_3-Al_2O_3-TiO_2- SiO_2-C-H_2-O_2. *Journal of Metamorphic Geology* **8**, 89–124.

Powell, R, and Holland, TJB, 1993. Is Least Squares an appropriate methodology to be used in the extraction of thermodynamic data from experimentally-bracketed mineral equilibria? *American Mineralogist*, **78**, 107-112.

Holland, TJB, and Powell, R, 1998. An internally-consistent thermodynamic dataset for phases of petrological interest. *Journal of Metamorphic Geology* **16**, 309–344.

How much of this you should read depends very much on how much you really think you need to know. If you are going to use THERMOCALC datafiles that we provide, there may be little point getting too involved. If, however, you want to fiddle with the data (via DQF) it is as well to have a clear understanding of the correlations within the data, and also what is *assumed* about activity-composition relationships in the data (as spelt out most clearly in the 1998 paper). If you are interested just in our philosophy of data extraction from experimental work, start with the 1993 paper. If you want to know more, having read the 1993 paper, continue with the 1998 paper, going to the earlier papers if there is something that you don't understand otherwise.

A brief outline

Whereas there is no substitute for reading the papers, two paragraphs extracted from the papers bring out some of what we have developed and what we follow. From the introduction of the Holland and Powell (1998) paper:

> The thermodynamic data extraction involves using weighted least squares on the different types of data (calorimetric, phase equilibria, natural mineral partitioning) to determine enthalpies of formation of the end-members of the phases. Entropies, volumes, heat capacities, thermal expansions and compressibilities are not derived by regression, but are taken as known in this process. Other parameters intimately involved, for example regular solution parameters in exchange equilibria, are also taken as known, having been determined separately by pre-processing the data. The entropies of the end-members in the data set are not determined along with the enthalpies by regression because, in most circumstances, they are determined more reliably by estimation techniques (e.g. Holland, 1989) than by fitting to experimental brackets. Where appropriate, such estimated entropies have been adjusted, within their likely uncertainties, to improve agreement with the experiments. The regression involves determination of the enthalpies of 189 end-members using 319 reaction equilibria, 82 direct calorimetric constraints on the end-member enthalpies of formation at 298 K, and 30 constraints from enthalpies of reaction and high-temperature calorimetry. Thus the total number of degrees of freedom in the regression is 242 ($319 + 82 + 30 - 189$), and the value for σ_{fit} is 1.14.

The abstract of the Powell & Holland (1993) encapsulates the least squares philosophy that has been followed in dataset generation, written in the context of some criticisms in the literature of our approach to constraining thermodynamic data using experimental data:

> The applicability of least squares in the extraction of thermodynamic data from experimentally-bracketed mineral equilibria is considered primarily as a statistical (and logical) problem concerning the nature of the experimental data, and the nature of the information which is to be extracted. The former relates particularly to the bracketed nature of the data, the latter to the requirement that not only thermodynamic data, but also the uncertainties on, and the correlations between the data, are to be extracted. By examining the probability distributions, it is shown that the majority of experimental brackets are approximately Gaussian distributed, primarily because experimental brackets are not generally very wide compared with experimental uncertainties on the bracket ends. Thus, using least squares on all the experimental brackets would be apposite for the thermodynamic data extraction problem. However, rather than fitting all the experimental brackets, we fit composite data formed from the individual experimental brackets for each experimentally-determined reaction. It is shown that the use of composite data is equivalent to using all the brackets as long as the composite data are determined appropriately. The main reason for wishing to use composite data is that it allows the deleterious effect on the least squares caused by inconsistent brackets to be minimised. The uncertainties on very few of the composite data are large compared with

the uncertainties on the ends of individual brackets. Therefore, least squares on composite data is appropriate for data extraction. Moreover much of the uncertainty on the extracted thermodynamic data comes from uncertainty on the position of the bracket ends rather than the width of the brackets themselves.

The following table shows the results of the least squares fitting by the program LSQDS on the body of experimental data used to generate the 1998 dataset (Holland & Powell, 1998, Table 7). Tim Holland regularly (continuously) upgrades the dataset, and the version we use in the Workshop is one from Sept 19, 1999, which is a minor upgrade of the Holland & Powell (1998), except that the new silicate model data is included (Holland & Powell, 2001), and the amphibole data are consistent with Dale et al. (2000). RP wrote and maintains the LSQDS software.

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Holland and Powell (1998) An internally consistent thermodynamic dataset for phases of petrological interest. Journal of Metamorphic Geology.

TABLE 7b: The experimental data used in setting up the least squares problem for solving for the enthalpies of formation of the phases in LSQDS, and the results of the least squares analysis. The experimental data are grouped according to chemical subsystems: (click on system below to go to relevant page for details)

The first columns give the experimental data, in the form of the P, T, x(CO_2) and ln K of the experiments, followed by the corresponding enthalpies of reaction calculated using the entropies, volumes etc in Table 5. LSQDS converts the enthalpies of reaction into an enthalpy of reaction bracket given in the first line of the summary. The least squares enthalpy of reaction (cH) is given in the second line of the summary, with its calculated uncertainty. The calc column gives the calculated T, P or ln K of the experimental conditions using the least squares results, followed by its uncertainty. The miss column gives the amount that the calculated T, P or ln K is outside the experimental bracket (if at all). In the summary information for each reaction, the code on the first line relates to the calculation of the enthalpy of reaction bracket (see Powell and Holland, 1993); the number at the end of the second line (if present) is a factor used in weighting experimental results in the least squares analysis; the comment making up the third line gives an overall appraisal of the relationship between the enthalpy of reaction bracket and the calculated enthalpy of reaction; uH on the fourth line is a measure of the uncertainty on each end of the enthalpy of reaction bracket arising from experimental uncertainties (in P, T etc), d/s is a measure of bracket overlap normalised to the uncertainty on bracket ends as discussed in Powell and Holland (1993), and h is the hat matrix diagonal.

SiO_2 & $CaO–SiO_2$

1) diam = gph   (Kennedy & Kennedy, 1976)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	47.0 46.0	1100	-2.10	-1.95		46.83	0.98	3 (-2.24 <-> -1.90)
0	-	50.0 49.0	1200	-2.13	-1.98		49.61	1.00	cH = -2.07 (sd 0.07)
0	-	53.0 52.0	1300	-2.17	-2.03		52.31	1.01	within bracket
0	-	56.0 54.0	1400	-2.23	-1.95		54.88	1.02	uH = 0.14, d/s = 0.2, h = 1.00
0	-	58.0 57.0	1500	-2.17	-2.03		57.32	1.03	
0	-	60.0 59.0	1600	-2.13	-1.99		59.60	1.05	

2) q = trd   (Ostrovsky, 1966)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	0.0	864 870	4.14	4.15		867	12	2 (4.14 <-> 4.16)
0	-	1.0	1040 1090	4.10	4.18		1070	12	cH = 4.15 (sd 0.01)
									within bracket
									uH = 0.01, d/s = 0.6, h = 0.98

3) trd = crst   (Ostrovsky, 1966)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	0.0	1465 1475	0.70	0.70		1468	12	2 (0.69 <-> 0.70)
0	-	1.0	1220 1260	0.68	0.70		1257	12	cH = 0.70 (sd 0.00)
									within bracket
									uH = 0.00, d/s = 0.5, h = 1.00

4) q = crst   (Ostrovsky, 1966; Jackson, 1976)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	2.2 1.6	1300	4.90	5.05	0.24	2.44	0.06	2 (4.85 <-> 4.91)
0	-	7.0	1730	4.43			2040	16	cH = 4.84 (sd 0.01)
0	-	5.0	1690		4.85		1684	14	too low but OK
									uH = 0.02, d/s = -1.3, h = 0.02

5) coe = q   (Bose & Ganguly, 1995)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	27.6 26.9	500	-5.37	-5.24		27.55	0.58	3 (-5.51 <-> -5.24)
0	-	28.4 27.6	600	-5.46	-5.30		27.93	0.58	cH = -5.37 (sd 0.05)
0	-	29.0 28.3	700	-5.48	-5.34		28.41	0.59	within bracket
0	-	29.8 29.0	800	-5.53	-5.37	-0.00	29.00	0.60	uH = 0.11, d/s = 0.0, h = 0.95
0	-	30.3 29.6	900	-5.49	-5.34		29.70	0.61	
0	-	31.1 29.9	1000	-5.48	-5.24		30.52	0.62	
0	-	31.7 30.9	1100	-5.41	-5.25		31.46	0.63	
0	-	32.6 31.8	1200	-5.38	-5.21		32.53	0.64	

* coe = q   (Bohlen & Boettcher, 1982; Gasparik, 1984)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	24.9 24.5	400	-4.90	-4.82	2.37	27.27	0.57	** NOT USED **
0	-	25.7 25.3	500	-5.00	-4.92	1.85	27.55	0.58	cH = -5.37 (sd 0.05)
0	-	26.6 26.1	600	-5.10	-5.00	1.33	27.93	0.58	
0	-	27.3 26.7	700	-5.14	-5.02	1.11	28.41	0.59	
0	-	28.1 27.7	800	-5.18	-5.10	0.90	29.00	0.60	
0	-	28.8 28.4	900	-5.18	-5.10	0.90	29.70	0.61	
0	-	29.9 29.4	1000	-5.24	-5.13	0.62	30.52	0.62	
0	-	31.1 30.6	1100	-5.29	-5.18	0.36	31.46	0.63	

6) stv = coe   (Zheng et al., 1996)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	90.6 87.0	1100	-31.14	-29.22		88.15	2.13	3 (-30.99 <-> -28.67)
0	-	93.2 90.4	1200	-30.76	-29.28		91.45	2.15	cH = -29.84 (sd 0.57)
0	-	96.3 93.0	1300	-30.61	-28.89		94.82	2.17	within bracket
0	-	97.6	1430		-28.97		1381	64	uH = 0.98, d/s = 0.7, h = 0.61
0	-	100.4	1530		-28.61		1462	64	

7) arag = cc (Johannes & Puhan, 1971; Crawford & Hoersch, 1972)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	4.1	70 90	-0.08	-0.00	31	121	14	5 (0.04 <-> 0.19)
0	-	5.0	160 200	0.04	0.21		178	12	cH = 0.11 (sd 0.03)
0	-	7.0	280 320	0.07	0.26		289	12	within bracket
0	-	9.0	380 420	0.08	0.28		387	12	uH = 0.04, d/s = -1.0, h = 0.95
0	-	11.0	460 500	0.03	0.23		477	10	
0	-	13.0	540 580	-0.00	0.20		562	10	
0	-	15.0	600 640	-0.11	0.10	3	643	10	

8) arag = cc (Irving & Wyllie, 1973)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	20.0 19.0	800	-0.02	0.16		19.25	0.31	3 (-0.04 <-> 0.16)
0	-	25.6 24.7	950	-0.15	-0.01	-0.80	23.90	0.35	cH = 0.11 (sd 0.03) 2
0	-	30.5 29.5	1100	-0.00	0.13		29.64	0.41	within bracket
									uH = 0.09, d/s = -0.1, h = 0.05

9) wo = pswo (Osborne & Shairer, 1941; Huang & Wyllie, 1975)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	0.0	1115 1135	6.34	6.41		1124	16	1 (6.34 <-> 6.40)
0	-	22.0 21.0	1550	6.32	6.40		21.37	0.69	cH = 6.37 (sd 0.03)
									within bracket
									uH = 0.03, d/s = 1.1, h = 0.99

10) cc = lime + CO2 (Smyth & Adams, 1923; Baker, 1962)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	1	0.0	930 950	176.81	179.51		947	6	3 (178.92 <-> 180.81)
0	1	0.0	1035 1065	178.91	182.62		1036	6	cH = 179.09 (sd 0.37)
0	1	0.0	1065 1095	179.42	183.05	-3	1062	6	within bracket
0	1	0.0	1140 1160	178.30	180.57		1147	6	uH = 0.68, d/s = 0.1, h = 0.54
0	1	0.0	1210 1230	178.66	180.81		1214	6	
0	1	0.0	1230 1250	179.13	181.26		1230	6	

11) cc + q = wo + CO2 (Zhu, Newton & Kleppa, 1993)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	1	2.3 1.9	700	88.66	90.51	-0.07	1.83	0.08	3 (89.49 <-> 90.50)
0	1	3.1 2.7	750	89.25	90.77	-0.02	2.68	0.10	cH = 90.86 (sd 0.20)
0	1	4.1 3.8	800	89.45	90.41	-0.14	3.66	0.12	too high but OK
0	1	5.2 4.9	850	89.63	90.46	-0.14	4.76	0.13	uH = 0.43, d/s = 0.9, h = 0.36

12) cc + q = wo + CO2 (Jacobs & Kerrick, 1981)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0.86	6.0	870 890	90.30	91.61		879	6	1 (90.34 <-> 91.56)
0	1	6.0	890 915	90.18	91.77		901	6	cH = 90.86 (sd 0.20)
									within bracket
									uH = 0.44, d/s = 1.5, h = 0.15

* cc + q = wo + CO2 (Ziegenbein & Johannes, 1974)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	1	2.0	690 710	89.24	90.80	1	711	6	** NOT USED **
0	1	4.0	790 810	89.07	90.46	6	816	6	cH = 90.86 (sd 0.20)
0	1	6.0	895 915	90.50	91.77		901	6	

* cc + q = wo + CO2 (Greenwood, 1967; Harker & Tuttle, 1955)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	1	1.0	662	685	93.05	95.02	-26	636	4	** NOT USED **
0	0.69	1.0	640		93.82		-33	607	4	cH = 90.86 (sd 0.20)
0	0.72	1.0		660		95.31		610	4	
0	1	2.0	725	750	91.97	93.91	-14	711	6	
0	0.80	2.0	700	711	91.77	92.65	-11	689	6	
0	0.50	2.0	658	679	91.38	93.16	-6	652	4	
0	1	1.0	650	690	92.03	95.45	-14	636	4	
0	1	2.0	730	750	92.36	93.91	-19	711	6	
0	1	2.7	780	800	92.99	94.46	-29	751	6	

13) cc + q = wo + CO2 (Haselton et al., 1978)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	1	9.3	1000	1015	89.84	90.68	3	1018	8	3 (89.84 <-> 90.99)
0	1	15.0	1175	1200	89.92	91.16		1194	8	cH = 90.86 (sd 0.20) 2
0	1	19.0	1300	1325	90.59	91.75		1306	8	within bracket
0	1	10.2	9.3	1015	89.05	90.68	-0.10	9.20	0.20	uH = 0.49, d/s = 0.1, h = 0.08

14) 3cc + 2wo = ty + CO2 (Zharikov & Shmulovich, 1969)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	1	0.1	800	830	125.67	128.82		830	6	3 (127.91 <-> 129.11)
0	1	0.2	880	890	127.27	128.23	7	897	6	cH = 128.86 (sd 0.31)
0	1	0.3	950	960	128.34	129.21		956	8	within bracket
0	1	0.4	960	980	128.02	129.69		970	8	uH = 0.51, d/s = -0.1, h = 0.90
0	1	0.5	990	1000	128.17	128.98		998	8	

15) ty = spu + CO2 (Zharikov & Shmulovich, 1968)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	1	0.1	850	860	123.40	124.40	7	867	6	3 (124.17 <-> 125.36)
0	1	0.2	930	940	124.32	125.24		939	6	cH = 125.13 (sd 0.32)
0	1	0.2	950	980	124.28	126.98		959	6	within bracket
0	1	0.3	990	1000	124.14	125.00	1	1001	8	uH = 0.51, d/s = -0.4, h = 0.89
0	1	0.5	1040	1060	124.79	126.44		1044	8	

16) spu + 4wo = 3rnk + CO2 (Zharikov & Shmulovich, 1968)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	1	0.1	850	870	156.80	159.34		867	14	2 (158.07 <-> 159.89)
0	1	0.2	920	940	158.62	161.00		923	14	cH = 158.98 (sd 0.84)
										within bracket
										uH = 0.65, d/s = 0.6, h = 1.00

17) spu + rnk = 4lrn + CO2 (Zharikov & Shmulovich, 1968)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	1	0.1	900	910	170.46	171.93		908	10	3 (170.77 <-> 172.50)
0	1	0.1	935	960	170.51	174.10		943	10	cH = 171.64 (sd 0.67)
0	1	0.2	980	1000	169.83	172.60		993	10	within bracket
0	1	0.3	1020	1050	171.08	175.17		1024	10	uH = 0.74, d/s = 0.6, h = 1.00

MgO–SiO_2

18) ta + 2en = anth   (Chernosky et al., 1985)

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  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc    2sd        summary
     0     -      10.0     755  780     8.39    8.79      3     783     18    1 (8.41 <-> 8.77)
                                                                              cH = 8.85 (sd  0.15)
                                                                              too high but OK
                                                                              uH = 0.13, d/s = 1.6, h = 0.51
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19) phA = 3br + 2fo   (Pawley & Wood, 1995)

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  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc    2sd        summary
     0     -  27.5 26.0     500        10.88   11.54          26.67   2.27   3 (10.88 <-> 11.61)
     0     -  34.8 32.5     600        11.04   11.95          34.29   2.63   cH = 11.24 (sd  0.51) 2
     0     -  39.5 37.5     650        10.88   11.58          38.46   2.87   within bracket
                                                                              uH = 0.30, d/s = 0.8, h = 1.00
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20) br = per + H2O   (Barnes & Ernst, 1963;)

```
  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc    2sd        summary
     0     0       0.5     564  574    80.87   81.60            573      4    3 (81.10 <-> 81.80)
     0     0       1.0     604  607    80.99   81.18      5     612      4    cH = 81.51 (sd  0.14) 2
     0     0       1.5     633  648    81.31   82.16            637      6    within bracket
     0     0       2.0     653  664    81.35   81.94            656      6    uH = 0.30, d/s = -0.3, h = 0.13
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21) br = per + H2O   (Aranovich & Newton, 1995)

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  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc    2sd        summary
     0     0       2.0     655  670    81.46   82.26            656      6    3 (81.23 <-> 81.86)
     0     0       4.2     715  730    81.23   81.93            721      6    cH = 81.51 (sd  0.14)
     0     0       7.0     770  790    80.98   81.82            783      8    within bracket
     0     0      10.0     830  845    81.29   81.87            836      8    uH = 0.25, d/s = 0.0, h = 0.77
     0     0      15.0     890  905    80.93   81.46      1     906      8
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22) br = per + H2O   (Schramke et al., 1981; Irving et al., 1977)

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  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc    2sd        summary
     0     0       4.0     690  725    80.29   81.93            716      6    1 (80.81 <-> 81.50)
     0     0       5.1     720  745    80.50   81.62            743      6    cH = 81.51 (sd  0.14) 2
     0     0       6.1     740  765    80.46   81.54            764      6    too high but OK
     0     0       8.1     785  806    80.77   81.62            803      8    uH = 0.24, d/s = 1.6, h = 0.08
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* br = per + H2O   (Irving et al., 1977)

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  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc    2sd        summary
     0     0      17.0     915  945    80.99   82.02            930      8     ** NOT USED **
     0     0      27.0    1020 1080    81.45   83.31           1022     10    cH = 81.51 (sd  0.14)
     0     0      33.0    1075 1105    81.93   82.83    -14    1061     10
```

23) 2ta = 3en + 2q + 2H2O   (Chernosky, 1976; Chernosky et al., 1985; Skippen, 1971)

```
  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc    2sd        summary
     0     0       0.5     656  672   216.19  219.55            663      2    3 (217.26 <-> 219.44)
     0     0       1.0     700  721   218.16  222.18     -3     697      2    cH = 217.66 (sd  0.27)
     0     0       2.0     725  735   217.03  218.77            729      4    within bracket
                                                                              uH = 0.93, d/s = 0.3, h = 0.10
```

24) 2ta = 3en + 2q + 2H2O   (Chernosky et al., 1985)

```
  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc    2sd        summary
     0     0      10.0     790  800   215.93  217.35      2     802      4    3 (214.48 <-> 216.14)
     0     0      13.0          800           216.01     12     812      4    cH = 217.66 (sd  0.27)
     0     0      13.6     785        213.80                    814      4    too high
     0     0      17.0     795        214.39                    820      4    uH = 0.70, d/s = 0.1, h = 0.08
```

25) 2ta = 3en + 2q + 2H2O (Jenkins, Holland & Clare, 1991)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	25.0	800	820	214.34	216.78	7	827	4	1 (214.54 <-> 216.57)
0	0	28.0	770		210.69			829	4	cH = 217.66 (sd 0.27)
										too high
										uH = 0.61, d/s = 2.0, h = 0.05

* 2ta = 3en + 2coe + 2H2O (Pawley & Wood, 1995)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	29.0	800	820	224.96	227.28	10	830	6	** NOT USED **
0	0	38.0	770	790	224.99	227.18	11	801	6	cH = 228.40 (sd 0.29)
0	0	49.0		730		224.48	38	768	6	

26) 2fo + 2ta = 5en + 2H2O (Chernosky, 1976; Chernosky et al., 1985)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	0.5	600	621	198.70	202.93		619	2	3 (201.46 <-> 203.75)
0	0	1.0	652	657	203.38	204.29	-4	648	4	cH = 202.61 (sd 0.30)
0	0	2.0	650	677	199.44	203.85		669	4	within bracket
0	0	3.0	673	692	201.56	204.53		680	4	uH = 0.97, d/s = -0.2, h = 0.36
0	0	4.0	686	691	202.72	203.48	-1	685	4	
0	0	6.0	679	694	201.21	203.36		689	4	

27) 2anth = 7en + 2q + 2H2O (Chernosky & Autio, 1979)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	1.0	719	760	197.50	204.02		735	6	3 (199.00 <-> 200.74)
0	0	1.5	752	767	199.28	201.51		757	6	cH = 199.97 (sd 0.40)
0	0	2.0	765	775	199.10	200.51		771	6	within bracket
0	0	3.0	755		195.37			790	6	uH = 0.74, d/s = 0.8, h = 0.30
0	0	10.0		815		200.77		808	8	

28) 7ta = 3anth + 4q + 4H2O (Chernosky & Autio, 1979)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	0.5	647	677	462.24	476.28	-1	646	2	3 (461.85 <-> 466.56)
0	0	1.0	664	687	456.41	466.24		677	4	cH = 461.87 (sd 0.70)
0	0	1.5	693	701	461.61	464.86		694	4	within bracket
0	0	2.0	706	719	461.90	467.02		706	4	uH = 2.00, d/s = 0.5, h = 0.22
0	0	3.0	727	742	462.72	468.39	-2	725	4	

29) 2anth + 2fo = 9en + 2H2O (Chernosky et al., 1985)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	0.5	632	667	183.21	189.20		642	6	1 (183.29 <-> 185.32)
0	0	2.0	677	710	181.86	186.26		700	6	cH = 184.92 (sd 0.43)
0	0	4.0	677		181.26			708	8	within bracket
0	0	5.0	684	735	182.64	188.54		704	8	uH = 0.72, d/s = 1.5, h = 0.14
0	0	6.0	661	701	180.93	185.40		697	8	

30) 9ta + 4fo = 5anth + 4H2O (Chernosky et al., 1985)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	1.0	625	645	450.19	458.97	-2	623	4	3 (447.63 <-> 453.25)
0	0	2.0	635	660	445.66	455.75		644	4	cH = 449.45 (sd 0.93)
0	0	5.0	665	685	445.49	452.89		676	6	within bracket
0	0	6.0	674	689	446.30	451.76		683	6	uH = 2.02, d/s = 0.4, h = 0.27

31) br + chr = 2fo + 3H2O (Johannes, 1968; Kitahara et al., 1966)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	1.0	350	370	212.99	216.17		358	4	1 (213.71 <-> 215.64)
0	0	3.0	380	400	213.26	215.80		388	6	cH = 214.29 (sd 0.52)
0	0	4.0	395	430	213.55	218.80		401	4	within bracket
0	0	7.0	415	440	212.60	216.31		427	8	uH = 0.61, d/s = 1.8, h = 0.48
0	0	18.2	450	520	210.33	219.40		481	8	
0	0	27.3	460	520	209.12	216.39		503	10	

32) 5chr = ta + 6fo + 9H2O (Chernosky, 1973)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	4.0	456	476	680.54	690.52		471	10	1 (682.38 <-> 689.97)
0	0	5.0	468	488	681.83	691.53		481	10	cH = 687.95 (sd 2.53)
										within bracket
										uH = 2.50, d/s = 1.7, h = 0.58

33) atg = 4ta + 18fo + 27H2O (Evans et al., 1976)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	2.0	480	540	2122.22	2222.55		531	8	3 (2198.23 <-> 2217.92)
0	0	4.0	520	570	2144.07	2220.72		562	10	cH = 2208.07 (sd 7.18)
0	0	6.0	560	590	2173.44	2216.89		584	10	within bracket
0	0	10.0	615	630	2207.15	2227.17		616	10	uH = 7.17, d/s = 0.7, h = 1.00
0	0	15.0	640	660	2205.88	2230.75		642	12	

34) 2cumm = 7en + 2q + 2H2O (Fonarev & Korolkov, 1980)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0.79	0	3.0	718	748	174.75	178.25		732	24	2 (174.66 <-> 178.07)
0.64	0	5.0	728	758	174.73	177.99		743	26	cH = 176.37 (sd 1.39)
										within bracket
										uH = 1.35, d/s = 1.2, h = 1.00

35) chum = 4fo + per + H2O (Duffy & Greenwood, 1979)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0.43	0	2.0	751		106.31	107.62		0.43	0.16	1 (106.37 <-> 107.56)
										cH = 106.97 (sd 0.68)
										within bracket
										uH = 0.41, d/s = 1.6, h = 1.00

36) mag = per + CO2 (Harker & Tuttle, 1955; Goldsmith & Heard, 1962)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	1	0.7	730	750	116.38	118.48		731	4	3 (116.53 <-> 117.99)
0	1	1.4	800	825	116.74	119.17	-3	797	4	cH = 116.43 (sd 0.23)
0	1	2.1	800	875	112.30	119.23		845	6	too low but OK
0	1	2.8	875	900	115.59	117.81		885	6	uH = 0.52, d/s = 1.0, h = 0.19
0	1	3.0		952		121.43		895	6	
0	1	5.0	977	1008	115.61	118.14		987	6	

37) mag = per + CO2 (Johannes & Metz, 1968; Philipp & Girsperger, 1990; Koziol & Newton, 1995)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	1	0.5	680	710	113.91	117.18		703	4	3 (115.43 <-> 116.68)
0	1	1.0	740	760	114.14	116.16	3	763	4	cH = 116.43 (sd 0.23)
0	1	2.0	810	835	113.79	116.12	3	838	6	within bracket
0	1	0.5	700	710	116.09	117.18		703	4	uH = 0.53, d/s = -0.0, h = 0.44
0	1	0.6 0.6	715		115.86	116.75		0.58	0.03	
0	1	1.0	760	770	116.16	117.17		763	4	

```
*  mag = per + CO2   (Irving & Wyllie, 1975)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc   2sd          summary
    0      1      18.0    1350 1400   114.25  117.46           1384     8     ** NOT USED **
    0      1      21.0    1420 1470   114.00  117.09           1459     8    cH = 116.43 (sd  0.23)
    0      1      22.7         1520           117.59           1501     8

*  2mag + 2q = en + 2CO2   (Johannes, 1969)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc   2sd          summary
    0      1       2.0     510  520   168.19  170.08     -3     507     4     ** NOT USED **
                                                                             cH = 167.66 (sd  0.40)


38)  2mag + 2q = en + 2CO2   (Koziol & Newton, 1995)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc   2sd          summary
    0      1       7.5     638  663   162.73  166.75      6     669     4    5 (166.59 <-> 170.42)
    0      1       8.0     640  670   161.30  166.09     10     680     4    cH = 167.66 (sd  0.40)
    0      1  10.6 10.2       715     164.81  166.00  -0.54    9.66  0.24    within bracket
    0      1      12.0     750  782   166.11  170.90            760     6    uH = 1.02, d/s = -1.9, h = 0.38
    0      1      14.0     801  820   168.35  171.12     -5     796     6
    0      1      15.5     816  851   166.81  171.82            822     6
    0      1      17.5     870  890   169.82  172.61    -15     855     6

*  2mag + 2coe = en + 2CO2   (Haselton et al., 1978)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc   2sd          summary
    0      1      37.0    1120 1140   154.54  157.02           1139     6     ** NOT USED **
    0      1      41.6    1185 1200   154.21  156.02      8    1208     6    cH = 156.93 (sd  0.41)

39)  2mag + en = 2fo + 2CO2   (Haselton et al., 1978; Koziol, 1994)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc   2sd          summary
    0      1       8.0     740  780   177.06  183.45            775     6    3 (179.96 <-> 183.74)
    0      1      10.0     810  830   179.53  182.60      1     831     6    cH = 182.72 (sd  0.41)
    0      1      14.0     930  950   182.22  185.09            933     6    within bracket
    0      1      17.6    1000 1020   179.94  182.67           1020     6    uH = 1.60, d/s = -0.3, h = 0.35
    0      1  23.1 22.2      1125     179.87  182.47  -0.08   22.12  0.28
    0      1      24.2    1150 1180   179.92  183.69           1172     6
    0      1      28.7    1240 1280   178.79  183.56           1273     6
    0      1      33.3    1380 1400   183.32  185.57     -5    1375     8
    0      1      37.0    1450 1500   182.04  187.45           1456     8

40)  ta + 5mag = 4fo + 5CO2 + H2O   (Greenwood, 1967)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc   2sd          summary
    0   0.40       2.0     540        562.57             -7     533     4    3 (563.93 <-> 572.63)
    0   0.35       2.0          550           571.18            529     4    cH = 558.10 (sd  1.01) 2
    0   0.75       2.0     560        563.61             -9     551     4    too low
    0   0.73       2.0          586           579.20            550     4    uH = 3.11, d/s = 1.1, h = 0.01
    0   0.51       2.0          560           570.17            540     4

41)  2wo + 2mont = di + merw   (Yoder, 1968)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc   2sd          summary
    0      -     6.0  6.7     740      24.97   26.20           6.04  0.27    1 (25.09 <-> 26.03)
    0      -     6.2  7.0     700      24.84   26.25           6.32  0.27    cH = 25.04 (sd  0.24)
    0      -     6.5  7.3     650      24.75   26.16           6.67  0.27    too low but OK
                                                                             uH = 0.24, d/s = 2.5, h = 0.46
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CaO–MgO–SiO_2

42) wo + mont = ak (Yoder, 1968)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	1.0	675 700	20.19	20.67	4	704	10	3 (20.52 <-> 20.79)
0	-	3.0	705 720	20.52	20.81		717	10	cH = 20.75 (sd 0.09)
0	-	5.0	720 750	20.56	21.13		730	10	within bracket
0	-	6.0	720 750	20.43	21.00		737	10	uH = 0.10, d/s = 0.6, h = 0.82

43) di + merw = 2ak (Yoder, 1968)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	7.5	780	14.64			850	20	3 (15.73 <-> 16.55)
0	-	7.0	810		16.43	1	811	18	cH = 16.45 (sd 0.24)
0	-	9.0	950 980	15.97	16.73		969	20	within bracket
0	-	10.0	1020 1050	15.73	16.50		1048	20	uH = 0.35, d/s = 0.7, h = 0.42

44) di + 3mont = fo + 2ak (Walter, 1963; Yoder, 1968)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	0.2	860 875	56.44	57.10		873	8	3 (56.77 <-> 57.46)
0	-	0.4	880 895	57.16	57.81	-4	876	8	cH = 56.99 (sd 0.17)
0	-	2.0	890 910	56.32	57.20		905	8	within bracket
0	-	5.0	950 975	56.54	57.63		960	8	uH = 0.25, d/s = -0.4, h = 0.89
0	-	10.0	1060 1090	57.29	58.61	-7	1053	8	

45) 2di + ta = tr (Jenkins,Holland & Clare, 1991)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-0.16	-	27.0 24.0	650	-8.53	-6.91		25.52	0.64	3 (-8.18 <-> -7.41)
-0.16	-	26.5 26.0	700	-8.10	-7.83	-0.18	25.82	0.63	cH = -7.73 (sd 0.17)
-0.16	-	26.0 25.0	725	-7.75	-7.20		25.96	0.62	within bracket
-0.16	-	27.0 26.0	750	-8.22	-7.66		26.11	0.62	uH = 0.33, d/s = -0.1, h = 0.60

46) di + 2mag = en + dol (Brey et al., 1983)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-0.01	-	23.0 20.0	850	9.76	10.91		20.03	2.92	3 (9.59 <-> 11.16)
0.05	-	28.5 25.5	970	9.83	10.92		25.55	3.11	cH = 10.90 (sd 0.56) 3
0.12	-	35.5 33.5	1100	9.92	10.59	-0.92	32.58	3.38	within bracket
0.15	-	41.5 39.5	1200	10.37	11.00		39.80	3.69	uH = 0.67, d/s = 0.1, h = 0.35
0.18	-	49.5 47.5	1300	10.46	11.03		47.95	4.09	

47) spu + 2mont = 2merw + cc (Walter, 1965)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	0.3	812 824	54.49	55.05	6	830	12	2 (54.81 <-> 55.39)
0	-	1.0	800 820	55.16	56.08		804	12	cH = 55.33 (sd 0.25)
									within bracket
									uH = 0.23, d/s = -0.2, h = 0.93

48) 2tr = 3en + 4di + 2q + 2H2O (Yin & Greenwood, 1983)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	0.1	655 675	228.76	233.45		674	4	3 (231.51 <-> 234.29)
0	0	0.2	725 745	231.33	235.65		733	4	cH = 233.12 (sd 0.36)
0	0	0.3	755 775	232.93	237.11		756	4	within bracket
0	0	0.8	800 820	231.08	234.87		811	4	uH = 0.99, d/s = -0.4, h = 0.17
0	0	1.4	820 840	228.68	232.19	5	845	4	

* 2tr = 3en + 4di + 2q + 2H2O (Boyd, 1959)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	0.6	795 820	233.71	238.63	-3	792	4	** NOT USED **
0	0	1.0	835 850	234.98	237.75	-10	825	4	cH = 233.12 (sd 0.36)
0	0	1.5	840 870	231.50	236.73		849	4	
0	0	2.0	860 880	232.21	235.56		865	4	

49) 2tr = 3en + 4di + 2q + 2H2O (Jenkins, Holland & Clare, 1991)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	1.5	840	860	231.50	234.99		849	4	3 (232.88 <-> 234.91)
0	0	3.0	880		232.12			886	4	cH = 233.12 (sd 0.36)
0	0	2.9		888		233.65		885	4	within bracket
0	0	5.0	914	930	234.17	236.55	-7	907	4	uH = 0.78, d/s = -0.3, h = 0.24
0	0	7.1	916	929	233.31	235.16	-1	915	6	

50) 2tr + 2fo = 5en + 4di + 2H2O (Jenkins, 1983)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0.09	0	5.0	820	840	216.51	219.36		831	6	3 (214.97 <-> 218.25)
0.09	0	8.0	790	810	214.73	217.38	5	815	6	cH = 218.06 (sd 0.39)
0.09	0	10.0	770	790	214.65	217.22	7	797	6	within bracket
0.09	0	20.0	640	660	216.09	218.39		657	8	uH = 1.39, d/s = 0.3, h = 0.19

* dol = cc + per + CO2 (Goldsmith, 1980)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
-0.14	1	9.0	1125	1140	118.23	119.30	36	1176	12	** NOT USED **
-0.14	1	9.5	1125	1150	117.04	118.82	43	1193	14	cH = 121.86 (sd 0.46)
-0.14	1	10.5	1050		109.36			1227	14	
-0.14	1	11.0		1180		117.55	63	1243	14	

* dol = cc + per + CO2 (Harker & Tuttle, 1955)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
-0.12	1	0.3	700	800	121.48	132.75		703	8	** NOT USED **
-0.12	1	0.7	780	820	123.97	128.16	-20	760	8	cH = 121.86 (sd 0.46)
-0.13	1	1.0	800	850	122.21	127.24	-3	797	10	
-0.13	1	2.8	900	950	120.30	124.75		918	10	

51) dol + 2q = di + 2CO2 (Slaughter et al., 75; Eggert & Kerrick, 1981; Jacobs & Kerrick, 1981)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0.95	2.0	505	525	156.20	159.63		508	6	3 (156.35 <-> 158.86)
0	0.73	6.0	610	630	156.32	159.37		613	6	cH = 156.76 (sd 0.48) 2
0	0.60	5.0	565	585	155.27	158.50		574	6	within bracket
										uH = 0.90, d/s = 1.2, h = 0.07

52) dol + 2q = di + 2CO2 (Eggler et al., 1976)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	1	28.0	970	1025	152.29	158.03		1013	10	1 (152.91 <-> 157.40)
										cH = 156.76 (sd 0.48) 2
										within bracket
										uH = 0.92, d/s = 3.1, h = 0.01

* dol + 2q = di + 2CO2 (Luth, 1995)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	1	35.0	1100	1150	156.58	161.25		1102	10	** NOT USED **
0	1	40.0	1150	1200	155.57	159.97		1163	10	cH = 156.76 (sd 0.48)
0	1	50.0	1300	1350	158.15	162.09	-17	1283	12	
0	1	60.0	1500	1550	163.92	167.36	-101	1399	14	

53) di + 3dol = 2fo + 4cc + 2CO2 (Kase & Metz, 1980)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
-0.33	0.90	3.0	623	653	207.27	213.48	9	662	12	3 (209.30 <-> 212.88)
-0.38	0.90	5.0	700	720	208.51	212.41	15	735	14	cH = 215.34 (sd 1.33) 2
-0.47	0.90	10.0	850	870	209.90	213.46	11	881	16	too high but OK
										uH = 1.43, d/s = 0.9, h = 0.25

54) 2dol + ta + 4q = tr + 4CO2 (Eggert & Kerrick, 1981)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0.22	6.0	540	560	309.91	317.29	-11	529	6	2 (309.20 <-> 315.04)
0	0.21	6.0	530	550	306.88	314.33	-3	527	6	cH = 305.80 (sd 0.98) 2
										too low
										uH = 2.09, d/s = 1.1, h = 0.04

55) di + cc = ak + CO2 (Walter, 1963)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0.05	1	0.5	895	905	151.97	153.12	-14	881	4	2 (151.59 <-> 153.10)
0.05	1	0.7	920	930	151.61	152.73	-11	909	4	cH = 150.36 (sd 0.25)
										too low
										uH = 0.64, d/s = 0.6, h = 0.19

56) ak + fo + cc = 3mont + CO2 (Walter, 1963)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0.05	1	0.5	885	905	93.52	94.95	-2	883	8	2 (92.93 <-> 94.19)
0.05	1	0.7	910	930	92.24	93.60		927	8	cH = 93.37 (sd 0.28)
										within bracket
										uH = 0.45, d/s = 0.1, h = 0.30

57) fo + di + 2cc = 3mont + 2CO2 (Walter, 1963)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0.10	1	0.5	885	905	244.33	248.07	-3	882	6	1 (244.55 <-> 247.85)
										cH = 243.73 (sd 0.51)
										too low but OK
										uH = 1.10, d/s = 1.7, h = 0.07

58) 5dol + 4ta = 6fo + 5di + 4H2O + 10CO2 (Skippen, 1971)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0.75	1.0	500	540	1242.03	1296.56		516	4	1 (1252.32 <-> 1273.66)
0	0.75	2.0	550	570	1250.34	1275.64		561	4	cH = 1264.30 (sd 2.62) 2
										within bracket
										uH = 6.60, d/s = 1.9, h = 0.01

59) ta + 3cc + 2q = 3di + H2O + 3CO2 (Skippen, 1971)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0.60	2.0	480	515	307.07	318.61		493	6	1 (308.31 <-> 317.37)
										cH = 311.33 (sd 1.02) 2
										within bracket
										uH = 1.71, d/s = 3.4, h = 0.01

60) 5dol + 8q + H2O = tr + 3cc + 7CO2 (Slaughter et al., 1975; Eggert & Kerrick, 1981)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
-0.12	0.85	2.0	474	494	459.00	470.01		484	8	3 (464.69 <-> 473.73)
-0.22	0.66	6.0	590	610	462.95	472.87		594	8	cH = 464.75 (sd 2.06) 2
-0.19	0.21	6.0	540	560	470.27	482.37	-9	531	6	within bracket
-0.19	0.21	6.0	530	550	464.19	476.33		531	6	uH = 3.23, d/s = -0.0, h = 0.14

61) 5ta + 6cc + 4q = 3tr + 6CO2 + 2H2O (Slaughter et al., 1975;)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0.50	2.0	425	465	586.60	613.78		444	6	1 (589.32 <-> 611.06)
										cH = 599.49 (sd 2.13) 2
										within bracket
										uH = 3.51, d/s = 3.9, h = 0.01

62) 3dol + 4q + H_2O = ta + 3cc + $3CO_2$ (Eggert & Kerrick, 1981; Metz & Puhan, 1971; Gordon & Greenwood)

ln_K	x(CO_2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
-0.15	0.50	3.0	485	505	158.74	163.03		486	12	3 (158.25 <-> 161.83)
-0.19	0.50	5.0	550	570	157.30	161.30		558	12	cH = 158.95 (sd 1.26) 2
-0.19	0.25	6.0	540	560	157.56	162.10		546	12	within bracket
-0.09	0.45	2.0	450		161.46		-11	439	10	uH = 1.28, d/s = -0.1, h = 0.25
-0.12	0.57	2.0		472		163.07		453	12	
-0.12	0.79	2.0	470		154.60			492	12	
-0.15	0.76	2.0		497		161.62		484	12	
-0.15	0.93	2.0	519		154.80			542	14	

63) tr + 3cc + 2q = 5di + $3CO_2$ + H_2O (Slaughter et al., 1975)

ln_K	x(CO_2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0.50	1.0	489	499	322.97	326.52	-11	478	6	2 (321.94 <-> 326.22)
0	0.90	1.0	476	496	318.12	325.18		479	6	cH = 319.06 (sd 1.03) 2
										too low
										uH = 1.82, d/s = 0.6, h = 0.07

64) tr + 11dol = 8fo + 13cc + $9CO_2$ + H_2O (Metz, 1976)

ln_K	x(CO_2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
-0.67	0.50	1.0	525	545	1007.68	1030.28		539	8	3 (1007.41 <-> 1024.20)
-0.80	0.50	3.0	610	630	1005.48	1025.68		628	10	cH = 1023.65 (sd 4.69) 2
-1.08	0.50	5.0	670	690	1003.97	1024.23		691	10	within bracket
										uH = 6.01, d/s = 1.4, h = 0.15

65) 3tr + 5cc = 11di + 2fo + $5CO_2$ + $3H_2O$ (Chernosky & Berman, 1986)

ln_K	x(CO_2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0.45	1.0	528	548	692.18	706.59		542	6	1 (693.35 <-> 705.42)
										cH = 702.24 (sd 1.85) 2
										within bracket
										uH = 3.69, d/s = 2.0, h = 0.02

Al_2O_3–SiO_2

66) ky = and (Holdaway, 1971; Newton, 1966a; Richardson et al., 1969; Bohlen et al 1991)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	-	2.4	377	409	4.24	4.54		390	12	3 (4.22 <-> 4.42)
0	-	3.6	447	499	3.99	4.47		487	12	cH = 4.36 (sd 0.05)
0	-	4.8	557	590	4.10	4.40		585	12	within bracket
0	-	7.0 5.6	700		3.75	4.79		6.18	0.15	uH = 0.07, d/s = 1.1, h = 0.50
0	-	7.5 5.6	750		3.82	5.23		6.77	0.15	
0	-	7.9 6.5	800		3.96	5.00		7.36	0.15	
0	-	8.5 6.9	800		3.51	4.70		7.36	0.15	
0	-	6.8 6.0	700		3.86	4.49		6.18	0.15	
0	-	7.9 7.2	825		4.18	4.66		7.66	0.15	
0	-	8.2	800		3.73			871	12	

67) ky = sill (Newton, 1966b; Richardson et al., 1969; Holdaway, 1971; Bohlen et al., 1991)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	-	7.0 5.5	600		6.60	7.43		5.85	0.23	3 (7.27 <-> 7.57)
0	-	8.8 7.0	700		6.81	7.80		8.02	0.23	cH = 7.24 (sd 0.06)
0	-	10.3 9.0	800		7.19	7.90		10.22	0.23	too low but OK
0	-	12.2 11.3	900		7.38	7.86	0.26	12.46	0.23	uH = 0.11, d/s = 0.3, h = 0.24
0	-	15.1 13.9	1000		7.05	7.68		14.74	0.24	
0	-	9.5 7.5	750		7.03	8.12		9.11	0.23	
0	-	9.0 7.2	750		7.30	8.28	0.11	9.11	0.23	
0	-	8.2	685		6.96			708	10	
0	-	7.0		710		7.92		653	10	
0	-	9.2	740		7.07			754	10	
0	-	8.8		785		7.83		736	10	
0	-	10.2	790		7.13			799	10	
0	-	9.8		835		7.88		781	10	
0	-	28.0 26.5	1500		6.80	7.53		27.10	0.26	
0	-	23.5	1300		6.45			1362	10	

68) and = sill (Holdaway, 1971; Bowman 1975; Kerrick & Heninger, 1984)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	-	1.8	571	663	2.69	2.94		642	28	1 (2.81 <-> 2.89)
0	-	3.6	491	527	2.80	2.90		520	28	cH = 2.88 (sd 0.04)
0	-	3.0	497		2.71			559	28	within bracket
0	-	4.3		506		2.97		475	26	uH = 0.02, d/s = 2.6, h = 0.85
0	-	1.2 2.5	615		2.69	2.94		2.19	0.38	
0	-	0.5	669	806	2.70	3.06		738	30	
0	-	3.0		607		3.01		559	28	
0	-	0.0		805		2.96		776	30	

* and = sill (Richardson et al., 1969)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	-	2.0	750	800	3.21	3.35	-122	628	28	** NOT USED **
0	-	3.0	650	750	3.13	3.41	-91	559	28	cH = 2.88 (sd 0.04)
0	-	4.0	650		3.32		-156	494	26	

69) ky = cor + q (Harlov & Newton, 1993)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	-	5.5 4.8	700		6.90	7.24		5.17	0.30	2 (6.88 <-> 7.09)
0	-	8.0 7.5	800		6.84	7.07		7.53	0.31	cH = 7.06 (sd 0.06)
										within bracket
										uH = 0.08, d/s = 1.0, h = 0.33

70) cor + q = and (Harlov & Newton, 1993)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	-	8.0 7.5	700		-2.76	-2.61		7.79	0.19	1 (-2.76 <-> -2.62)
										cH = -2.70 (sd 0.04) 0.5
										within bracket
										uH = 0.05, d/s = 1.6, h = 0.84

71) 2dsp = cor + H2O (Haas, 1972; Hemley et al., 1980; Grevel et al., 1994)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	1.0	382	406	82.56	84.27	-11	371	4	5 (80.97 <-> 82.31)
0	0	1.8	385	410	81.77	83.54		385	4	cH = 81.80 (sd 0.18)
0	0	2.4	392	415	81.46	83.11		397	4	within bracket
0	0	3.5	410	430	81.51	83.02		414	4	uH = 0.37, d/s = -1.8, h = 0.56
0	0	4.8	415	440	80.62	82.47		431	4	
0	0	7.0	450	470	81.28	82.73		457	4	
0	0	14.5	500	530	79.60	81.63	3	533	6	
0	0	24.0	575	600	79.60	81.20	9	609	6	
0	0	28.5	625	650	80.81	82.37		641	6	
0	0	38.0	670	700	80.03	81.84		699	6	
0	0	47.5	700	740	78.92	81.28	9	749	8	

72) 2dsp = cor + H2O (Vidal et al., 1994)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
-0.05	0	25.0	595	615	80.80	82.08		611	6	1 (80.85 <-> 82.03)
-0.05	0	28.0	615	650	80.77	82.97		631	6	cH = 81.80 (sd 0.18)
										within bracket
										uH = 0.42, d/s = 1.5, h = 0.10

73) prl + 6dsp = 4and + 4H2O (Haas & Holdaway, 1973; Hemley et al., 1980)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	1.0	325	349	309.46	316.62		343	4	3 (309.49 <-> 313.67)
0	0	2.4	340	400	305.82	321.97		373	4	cH = 314.94 (sd 0.72) 2
0	0	3.5	365	395	307.05	314.74	1	396	4	too high but OK
0	0	4.8	395	415	308.32	313.70	4	419	4	uH = 1.50, d/s = 1.4, h = 0.06
0	0	7.0	435	455	309.29	314.93		455	6	

74) 2dsp + 4q = prl (Theye et al., 1997)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	-	25.0	500	535	1.31	1.48		533	26	2 (1.42 <-> 1.56)
0	-	23.0	500	540	1.49	1.69	-5	495	24	cH = 1.47 (sd 0.06)
										within bracket
										uH = 0.05, d/s = -0.2, h = 0.97

75) 2dsp + 4coe = prl (Theye et al., 1997)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	-	28.3 26.0	550		-20.67	-18.63		27.53	0.47	1 (-20.49 <-> -18.82)
										cH = -19.99 (sd 0.21)
										within bracket
										uH = 0.48, d/s = 2.1, h = 0.05

76) prl = cor + 4q + H2O (Chatterjee et al., 1984)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	3.0	400	460	78.54	82.86		425	6	1 (80.12 <-> 82.20)
0	0	5.0	440	500	79.48	83.69		452	6	cH = 80.33 (sd 0.18)
0	0	7.0	460	520	79.26	83.33		476	6	within bracket
0	0	10.0	500	540	79.85	82.47		507	6	uH = 0.35, d/s = 3.7, h = 0.05

77) prl = and + 3q + H2O (Hemley et al., 1980; Kerrick, 1968)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	1.0	354	378	77.52	79.15		356	4	3 (78.41 <-> 79.29)
0	0	1.8	395	425	78.96	81.08	-22	373	4	cH = 77.63 (sd 0.19)
0	0	3.9	415	445	77.47	79.57		417	4	too low
										uH = 0.32, d/s = 0.3, h = 0.14

78) prl = and + 3q + H_2O (Haas & Holdaway, 1973)

ln_K	x(CO_2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	3.5	390 415	76.38	77.97		410	4	1 (76.43 <-> 77.38)
0	0	4.8	410 430	76.07	77.43	3	433	6	cH = 77.63 (sd 0.19) 2
0	0	7.0	450 470	76.36	77.70		469	6	too high but OK
									uH = 0.33, d/s = 1.6, h = 0.06

79) kao + 2q = prl + H_2O (McPhail unpub; Hemley et al., 1980)

ln_K	x(CO_2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	1.0	261 285	59.88	61.25	3	288	6	2 (60.91 <-> 61.70)
0	0	5.0	306 333	61.35	62.84		307	8	cH = 61.43 (sd 0.37)
									within bracket
									uH = 0.28, d/s = -0.2, h = 0.65

80) 2kao = 2dsp + prl + $2H_2O$ (Hemley et al., 1980)

ln_K	x(CO_2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	1.0	288 312	120.56	123.29		295	8	1 (120.84 <-> 123.02)
									cH = 121.38 (sd 0.73)
									within bracket
									uH = 0.57, d/s = 2.4, h = 0.35

81) tpz = ky + H_2O (Wunder et al. 93)

ln_K	x(CO_2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	55.0 50.0	700	68.04	70.09		50.06	3.18	2 (69.33 <-> 70.80)
0	0	90.0 85.0	1000	70.04	71.68		89.93	4.14	cH = 70.06 (sd 0.67)
									within bracket
									uH = 0.56, d/s = 0.0, h = 1.00

CaO–Al_2O_3–SiO_2

82) cz = zo (Holland, unpub)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	6.0	325 375	-0.79	-0.44		373	78	1 (-0.56 <-> -0.45)
0	-	15.0	350 500	-0.57	0.76		369	98	cH = -0.46 (sd 0.31) 2
									within bracket
									uH = 0.03, d/s = 1.9, h = 0.82

83) gr + 2ky + q = 3an (Koziol & Newton, 1987; Goldsmith, 1980)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	25.3 24.9	1150	38.83	41.24		24.98	0.20	3 (36.62 <-> 43.51)
0	-	23.2 22.8	1050	37.43	39.86	-0.15	22.65	0.20	cH = 40.75 (sd 0.61)
0	-	24.3 23.2	1100	37.81	44.46		23.81	0.20	within bracket
0	-	22.3 21.3	1000	35.87	41.98		21.50	0.20	uH = 2.92, d/s = 0.0, h = 0.26
0	-	20.3 18.8	900	34.08	43.33		19.22	0.20	
0	-	21.1 20.3	950	36.19	41.10		20.36	0.20	
0	-	24.0 22.0	1100	39.62	51.74		23.81	0.20	
0	-	26.0 24.0	1150	34.63	46.66		24.98	0.20	
0	-	26.7 25.8	1200	37.52	42.90		26.16	0.20	
0	-	28.2 27.1	1250	35.68	42.21		27.35	0.20	
0	-	27.0 25.0	1200	35.72	47.69		26.16	0.20	
0	-	28.0 26.0	1250	36.86	48.77		27.35	0.20	
0	-	29.0 27.0	1300	38.05	49.91		28.54	0.20	

* gr + 2ky + q = 3an (Gasparik, 1984; Hays, 1967)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	26.4 25.3	1200	39.31	45.89		26.16	0.20	** NOT USED **
0	-	28.2 27.3	1300	42.79	48.13	0.34	28.54	0.20	cH = 40.75 (sd 0.61)
0	-	27.0 23.0	1200	35.72	59.71		26.16	0.20	
0	-	29.0 28.0	1300	38.05	43.97		28.54	0.20	
0	-	32.0 30.0	1400	34.78	46.49		30.98	0.21	

84) gr + q = an + 2wo (Huckenholz et al., 1975; Newton, 1966; Hays, 1967; Windom & Boettcher, 1976)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	2.0	565 585	52.45	53.88		578	8	3 (52.92 <-> 54.06)
0	-	3.0	615 635	52.81	54.23		623	8	cH = 53.37 (sd 0.29)
0	-	4.0	665 685	53.16	54.57		668	8	within bracket
0	-	4.7	695 725	53.06	55.17		699	8	uH = 0.41, d/s = 0.9, h = 0.72
0	-	6.3 5.4	750	51.88	54.72		5.83	0.18	
0	-	14.5 13.5	1100	51.23	54.31		13.80	0.19	
0	-	16.1 11.6	1100	46.32	60.20		13.80	0.19	
0	-	17.0 15.3	1200	50.77	55.97		16.15	0.19	

85) gr + cor = geh + an (Boettcher, 1970; Huckenholz et al., 1975)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	1.0	760 780	98.92	100.98		761	14	3 (100.22 <-> 101.90)
0	-	5.0	930 950	100.08	102.13	-11	919	16	cH = 98.99 (sd 0.77) 2
0	-	6.0	975 995	100.65	102.70	-16	959	16	too low but OK
									uH = 0.61, d/s = 0.3, h = 0.41

86) 2gr = 3wo + geh + an (Huckenholz et al., 1975; Hays, 1967)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	1.0	880 900	162.83	165.88		899	12	3 (162.25 <-> 164.99)
0	-	2.0	920 940	162.75	165.79		940	12	cH = 165.73 (sd 0.86) 2
0	-	3.0	960 985	162.69	166.49		980	12	too high but OK
0	-	7.5	1120 1150	159.58	164.15	10	1160	12	uH = 0.98, d/s = 0.7, h = 0.28
0	-	10.2	1240	161.57			1267	12	
0	-	8.8	1210		165.43	2	1212	12	
0	-	10.0 7.5	1200	156.68	171.78		8.50	0.29	
0	-	11.0 9.0	1250	158.30	170.33		9.76	0.29	

87) gr + 2cor = 3cats (Gasparik, 1984)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	-	12.8 11.3	1170		71.85	73.97		11.58	0.53	3 (72.90 <-> 74.24)
0	-	15.5 14.4	1230		72.25	73.78		14.55	0.54	cH = 73.57 (sd 0.37)
0	-	17.0 15.9	1270		72.96	74.48		16.56	0.54	within bracket
0	-	18.1 16.9	1300		73.54	75.20		18.08	0.54	uH = 0.57, d/s = 0.2, h = 0.97
0	-	23.7 22.5	1400		72.97	74.58		23.25	0.56	
0	-	29.3 28.2	1500		72.64	74.07		28.58	0.57	

88) gr + 3ky = 3an + cor (Gasparik, 1984)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	-	28.2 27.4	1300		46.02	51.11		27.92	0.19	2 (44.31 <-> 52.82)
0	-	30.7 29.8	1400		45.65	51.31		30.36	0.20	cH = 47.81 (sd 0.61)
										within bracket
										uH = 3.61, d/s = 0.7, h = 0.04

89) gr + 3cats = 2an + 2geh (Hays, 1967)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	-	14.9 13.9	1300		119.15	125.62		14.09	0.49	1 (119.49 <-> 125.28)
										cH = 124.40 (sd 1.55) 2
										within bracket
										uH = 1.98, d/s = 1.6, h = 0.06

90) 3cats = an + geh + cor (Hays, 1967)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	-	13.9 10.9	1200		19.83	27.47		11.71	0.67	1 (24.70 <-> 26.70)
0	-	13.0 11.8	1250		23.76	26.81		12.35	0.67	cH = 25.41 (sd 0.83) 2
0	-	14.0 12.0	1350		24.48	29.55		13.63	0.68	within bracket
0	-	14.6 13.0	1400		24.59	28.62		14.27	0.68	uH = 0.69, d/s = 1.6, h = 0.18

91) gr + 3ky = 3an + cor (Gasparik, 1984)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	-	28.3 27.3	1300		45.39	51.74		27.92	0.19	2 (44.31 <-> 52.82)
0	-	30.8 29.7	1400		45.02	51.94		30.36	0.20	cH = 47.81 (sd 0.61)
										within bracket
										uH = 3.61, d/s = 0.9, h = 0.03

92) 3an + cc = me (Baker & Newton, 1994)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	-	1.5	847	860	63.95	64.67		854	10	3 (63.98 <-> 64.70)
0	-	3.6	848		63.85			857	10	cH = 64.34 (sd 0.30)
0	-	3.2		865		64.82		856	10	within bracket
0	-	6.7	853		63.90			861	10	uH = 0.28, d/s = 1.2, h = 0.99
0	-	7.2		873		64.96		862	10	
0	-	15.0	865	880	64.00	64.81		871	10	

* 3an + cc = me (Goldsmith & Newton, 1977)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	-	1.0	850	900	64.15	66.92		853	10	** NOT USED **
0	-	5.0	850	900	63.85	66.61		859	10	cH = 64.34 (sd 0.30)
0	-	8.0	850	900	63.64	66.39		863	10	
0	-	10.0	850	875	63.50	64.87		865	10	
0	-	15.0	850	900	63.18	65.90		871	10	

93) gr + cc + 2ky + q = me (Baker & Newton, 1994)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	19.7	900	103.38			909	6	3 (101.78 <-> 108.79)
0	-	23.0 22.1	1000	102.38	107.93		22.56	0.21	cH = 105.09 (sd 0.67)
0	-	26.5 26.0	1100	100.36	103.40	-0.28	25.72	0.22	within bracket
0	-	29.4	1200	102.26			1215	6	uH = 2.97, d/s = 0.0, h = 0.06
0	-	27.5	1190		111.77		1156	6	
0	-	26.6	1145		108.47		1128	6	

94) 4zo + q = 5an + gr + 2H2O (Boettcher, 1970; Newton, 1966; Chatterjee et al., 1984)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	4.0	570 610	207.80	216.50		580	4	3 (207.48 <-> 211.08)
0	0	5.3	630 660	207.50	213.89		642	4	cH = 210.06 (sd 0.48)
0	0	2.0	485 535	210.18	221.49	-1	484	4	within bracket
0	0	4.7	600	207.13			614	4	uH = 1.53, d/s = -0.7, h = 0.26
0	0	6.0 5.5	650	204.76	209.75	-0.03	5.47	0.10	
0	0	7.5 6.8	720	204.70	211.53		6.95	0.10	
0	0	2.0	480 510	209.05	215.83		484	4	
0	0	5.1	610 640	205.23	211.65		633	4	
0	0	6.0	660 670	206.87	208.98	5	675	4	
0	0	8.0	740 760	204.00	208.10	10	770	4	

95) 4zo + q = 5an + gr + 2H2O (Newton, 1966)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	4.6	600 640	208.15	216.76		609	4	3 (207.16 <-> 211.73)
0	0	6.0	650 700	204.76	215.29		675	4	cH = 210.06 (sd 0.48)
0	0	8.0	740 770	204.00	210.14		770	4	within bracket
									uH = 1.64, d/s = 0.6, h = 0.05

96) 6zo = 6an + 2gr + cor + 3H2O (Boettcher 1970; Newton 1965; Chatterjee et al., 1984)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	3.0	620 665	299.04	311.26		630	6	3 (301.07 <-> 305.11)
0	0	2.0	570 585	299.29	303.52		579	6	cH = 301.78 (sd 0.78)
0	0	4.1	670 700	297.73	305.64		685	6	within bracket
0	0	4.6	700 730	299.11	306.90		710	6	uH = 1.71, d/s = 0.1, h = 0.61
0	0	5.6	765 795	303.06	310.62	-5	760	6	
0	0	6.1	785 815	301.84	309.32		785	6	
0	0	6.8	815 845	300.68	308.04		819	6	
0	0	2.0	560 590	296.48	304.93		579	6	
0	0	4.0	680 690	301.69	304.33		680	6	
0	0	8.0	870 890	299.61	304.39		879	6	

97) 2cz + ky + q = 4an + H2O (Jenkins et al., 1983)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	7.5 7.1	550	120.54	123.77	-0.09	7.01	0.18	1 (120.29 <-> 124.03)
									cH = 124.49 (sd 0.71)
									too high but OK
									uH = 1.57, d/s = 1.0, h = 0.11

98) 4cz + q = 5an + gr + 2H2O (Liou, 1973)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
6.19	0	3.0	670 694	208.24	214.46		670	10	1 (208.74 <-> 213.96)
									cH = 208.23 (sd 1.30) 2
									too low but OK
									uH = 1.61, d/s = 1.9, h = 0.05

99) 4cz + q = 5an + gr + 2H2O (Holdaway, 1972)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
6.19	0	3.0	690 710	213.42	218.66	-20	670	10	1 (213.68 <-> 218.40)
									cH = 208.23 (sd 1.30) 2
									too low
									uH = 1.63, d/s = 1.6, h = 0.06

100) 2zo + ky + q = 4an + H2O (Goldsmith, 1981; Jenkins et al., 1983; Johannes, 1984)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	4.0 3.0	400	118.99	127.28		3.22	0.09	3 (122.17 <-> 126.43)
0	0	5.0 4.2	450	119.70	126.26		4.30	0.10	cH = 125.41 (sd 0.39)
0	0	6.0	510 530	122.26	125.81		528	4	within bracket
0	0	5.0	450 490	119.70	126.84		482	4	uH = 1.81, d/s = 0.3, h = 0.20
0	0	7.8 7.0	580	120.16	126.57		7.14	0.10	
0	0	7.0	550 580	121.28	126.57		573	4	
0	0	8.0	570 625	116.80	126.47		619	4	
0	0	9.0	650 675	122.89	127.25		664	4	
0	0	10.0	705 725	124.57	128.02		710	4	
0	0	10.3	695 725	120.49	125.67		723	4	

101) 2zo + sill + q = 4an + H2O (Newton, 1966; Newton & Kennedy, 1963)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	7.5 7.0	550	111.54	115.27	-0.39	6.61	0.11	3 (113.86 <-> 117.75)
0	0	9.2 8.6	650	115.32	119.74		8.81	0.11	cH = 118.17 (sd 0.40)
0	0	9.3 7.7	620	109.71	121.53		8.15	0.11	too high but OK
0	0	10.0	670 730	112.71	122.37		704	4	uH = 1.45, d/s = -0.0, h = 0.08

102) ma = an + cor + H2O (Chatterjee, 1974)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	1.0	470 500	90.14	92.71		477	4	3 (90.46 <-> 91.43)
0	0	2.0	500 520	90.24	91.85		506	4	cH = 90.71 (sd 0.17)
0	0	4.0	560 570	90.87	91.63	-2	558	4	within bracket
0	0	6.0	600 610	90.31	91.03		606	4	uH = 0.41, d/s = 0.2, h = 0.31
0	0	7.0	620 640	90.10	91.53		628	4	

* ma = an + cor + H2O (Storre & Nitsch, 1974)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	3.0	510 530	88.96	90.51	3	533	4	** NOT USED **
0	0	5.0	570 590	89.82	91.30		582	4	cH = 90.71 (sd 0.17)
0	0	7.0	620 660	90.10	92.95		628	4	

* ma + q = an + and + H2O (Storre & Nitsch, 1974)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	4.0	490 540	84.25	87.98		540	4	** NOT USED **
0	0	5.0	515 560	84.09	87.38	9	569	4	cH = 88.01 (sd 0.17)

* ma + q = an + ky + H2O (Storre & Nitsch, 1974)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	5.0	530 570	81.48	84.04		564	6	** NOT USED **
0	0	7.0	580 600	82.24	83.47	3	603	6	cH = 83.65 (sd 0.16)
0	0	9.0	640 660	83.70	84.89	-1	639	6	

103) 4ma + 3q = 2zo + 5ky + 3H2O (Jenkins, 1984)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	9.0 10.0	500	204.50	208.58	0.15	10.15	0.29	3 (208.16 <-> 210.28)
0	0	8.4 10.0	550	205.48	211.77		9.36	0.30	cH = 209.19 (sd 0.58)
0	0	8.4 9.0	600	208.82	211.06		8.50	0.33	within bracket
0	0	7.7 8.3	650	209.66	211.76	-0.14	7.56	0.36	uH = 0.76, d/s = -0.7, h = 0.67

```
*  ma + q = an + and + H2O   (Nitsch et al., 1981)

   ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc    2sd        summary
     0      0       2.0     440  460    84.76   86.33     21     481      4     ** NOT USED **
     0      0       4.0     510  520    85.74   86.49     20     540      4    cH = 88.01 (sd  0.17)
     0      0       5.0     560  570    87.38   88.11            569      4

*  ma + q = an + ky + H2O   (Nitsch et al., 1981)

   ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc    2sd        summary
     0      0       6.0     575  585    83.10   83.73            584      6     ** NOT USED **
     0      0       7.0     590  600    82.86   83.47      3     603      6    cH = 83.65 (sd  0.16)

104)  4ma = 2zo + 2ky + 3cor + 3H2O   (Chatterjee et al., 1984)

   ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc    2sd        summary
     0      0      12.0     540        226.86                    580     14    1 (227.19 <-> 229.95)
     0      0      13.0          550          230.74             546     14    cH = 230.37 (sd  0.59)
     0      0      10.0     600  640   226.63  230.29      1     641     14    too high but OK
                                                                               uH = 0.76, d/s = 2.3, h = 0.13

105)  law = an + 2H2O   (Crawford & Fyfe, 1965)

   ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc    2sd        summary
     0      0       6.9     400  450   145.33  152.35            448      4    1 (148.91 <-> 151.96)
     0      0     6.0  4.5     400     148.52  154.04           5.02   0.13    cH = 152.08 (sd  0.25)
     0      0       5.5     375        147.25                    413      2    too high but OK
                                                                               uH = 0.79, d/s = 2.4, h = 0.02


106)  4law + 2q = 2zo + prl + 6H2O   (Nitsch, 1972)

   ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc    2sd        summary
     0      0       7.0     370  430   405.00  422.92            386      4    1 (406.22 <-> 421.69)
                                                                               cH = 409.65 (sd  0.95)
                                                                               within bracket
                                                                               uH = 1.76, d/s = 5.1, h = 0.01

*  12law = 6zo + 2ky + prl + 20H2O   (Nitsch, 1972)

   ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc    2sd        summary
     0      0       4.0     340  375  1379.92 1417.51     -4     336      4     ** NOT USED **
     0      0       7.0     390  430  1375.05 1416.17            391      4    cH = 1375.50 (sd  2.78)

107)  5law = 2zo + ma + 2q + 8H2O   (Nitsch, 1974)

   ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc    2sd        summary
     0      0       4.0     325  355   553.34  567.37     -4     321      4    3 (550.03 <-> 557.31)
     0      0       7.0     370  400   547.44  559.14            380      4    cH = 551.36 (sd  1.16)
     0      0      10.0     415  445   541.75  555.17            437      6    within bracket
                                                                               uH = 2.61, d/s = 0.4, h = 0.12

108)  2law + dsp = zo + ky + 4H2O   (Schmidt & Poli, 1994)

   ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc    2sd        summary
     0      0      16.0     510  540   278.77  284.79            510      4    5 (277.17 <-> 280.93)
     0      0      22.0     550  580   273.33  279.03            579      6    cH = 278.84 (sd  0.47)
     0      0      28.5     630  660   275.39  280.73            649      6    within bracket
     0      0      33.0     710  725   281.18  283.72    -14     696      6    uH = 1.38, d/s = -0.8, h = 0.16
     0      0      36.0          740          281.01             727      6
```

109) 4law = 2zo + ky + q + 7H2O (Schmidt & Poli, 1994; Chatterjee et al., 1984)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	16.0	510	550	478.67	492.43		522	6	3 (478.60 <-> 485.15)
0	0	22.0	580		475.98			602	6	cH = 482.93 (sd 0.92)
0	0	21.5		598		483.87		595	6	within bracket
0	0	19.0	545	577	477.16	487.80		562	6	uH = 2.35, d/s = 1.1, h = 0.06
0	0	14.0	480	550	477.57	502.19		495	6	

110) 4law = 2zo + ky + q + 7H2O (Newton & Kennedy, 1963)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	13.5		500		487.09		488	6	3 (480.99 <-> 486.69)
0	0	17.5	540	550	482.10	485.48		542	6	cH = 482.93 (sd 0.92)
0	0	21.5	590		481.29			595	6	within bracket
0	0	25.0	640	650	482.85	485.95		640	6	uH = 2.42, d/s = 0.5, h = 0.26
0	0	29.5	660	720	471.76	489.54		698	6	
0	0	33.5	730	760	477.82	486.33		748	8	

111) 4law = 2zo + ky + coe + 7H2O (Skrok et al., 1994)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	19.0	565	595	487.39	497.28		568	6	3 (483.47 <-> 490.78)
0	0	24.0	615	645	483.59	492.97		630	6	cH = 488.29 (sd 0.92)
0	0	28.5	670	705	483.89	494.30		685	6	within bracket
0	0	33.0	720	750	482.97	491.51		739	8	uH = 2.65, d/s = -0.8, h = 0.28
0	0	38.0	770	805	480.71	490.20		798	8	
0	0	43.0	820	855	478.75	487.82	2	857	8	
0	0	47.5	855	890	474.66	483.40	20	910	10	

* pre = an + wo + H2O (Chatterjee et al., 1984)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	0.5	410	430	89.76	91.59	23	453	4	** NOT USED **
0	0	1.0	430	460	90.11	92.77	12	472	4	cH = 93.82 (sd 0.19)
0	0	2.0	460	470	90.14	90.98	33	503	4	
0	0	4.0	500	520	88.87	90.47	42	562	4	
0	0	5.0	530	540	89.14	89.93	49	589	4	

112) 5pre = 2zo + 2gr + 3q + 4H2O (Connolly & Kerrick, 1985)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	1.0	410	430	228.36	231.15		427	8	5 (229.66 <-> 231.65)
0	0	2.0	407	427	229.44	231.87		417	6	cH = 230.65 (sd 0.51)
0	0	4.0	380	400	232.57	233.78	-24	356	6	within bracket
										uH = 0.58, d/s = -1.2, h = 1.00

113) wrk = an + 2q + 2H2O (Liou, 1970)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	1.0	340	355	125.00	126.23	18	373	6	4 (127.17 <-> 128.34)
0	0	2.0	365	380	126.83	127.88		377	8	cH = 127.67 (sd 0.40) 2
0	0	3.0	365	390	126.95	128.56		376	8	within bracket
0	0	4.3	375	405	128.11	129.88	-7	368	8	uH = 0.35, d/s = -3.6, h = 0.52
0	0	5.0	380	400	128.78	129.85	-18	362	8	

114) lmt = an + 2q + 4H2O (Thompson, 1970)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	1.0	300	320	245.34	248.83		304	2	3 (243.54 <-> 245.74)
0	0	2.0	307	327	243.72	247.01		322	2	cH = 246.12 (sd 0.34) 2
0	0	4.0	328	348	242.53	245.53	4	352	2	too high but OK
0	0	6.0	337	357	240.45	243.24	22	379	4	uH = 0.79, d/s = -1.3, h = 0.05

115) lmt = wrk + 2H2O (Liou, 1971)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	0.5	220	240	118.05	119.81		225	4	5 (118.11 <-> 119.38)
0	0	1.0	250	260	119.26	120.14	-9	241	4	cH = 118.45 (sd 0.40) 2
0	0	2.0	274	284	118.59	119.44	-2	272	4	within bracket
0	0	3.0	294	301	117.62	118.20	3	304	4	uH = 0.44, d/s = -4.3, h = 0.54
0	0	5.0	316	328	114.49	115.42	41	369	8	

116) law + 2q + 2H2O = lmt (Liou, 1971)

ln_K	x(CO2)	P(kbar)		T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	3.0	2.8	200	-93.06	-92.67	0.49	3.49	0.26	4 (-94.22 <-> -93.80)
0	0	3.5	3.0	250	-94.48	-93.54		3.27	0.28	cH = -94.04 (sd 0.27) 2
0	0	3.5	3.2	300	-95.04	-94.51	-0.28	2.92	0.31	within bracket
										uH = 0.13, d/s = -5.8, h = 0.85

117) law + 2q = wrk (Liou, 1971)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	-	3.2		312		23.92	7	319	12	3 (23.14 <-> 24.25)
0	-	3.5	305	333	22.16	24.09	5	338	12	cH = 24.41 (sd 0.40) 2
0	-	4.0	355	365	23.47	24.16	4	369	12	too high but OK
0	-	4.3	381		23.98			387	12	uH = 0.47, d/s = -0.1, h = 0.16

118) heu = lmt + 3q + 2H2O (Cho et al., 1987)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	1.5	160	190	113.27	115.38		178	12	1 (113.87 <-> 115.21)
0	0	2.0	160	190	113.70	115.77		172	12	cH = 114.54 (sd 1.32) 2
										within bracket
										uH = 0.35, d/s = 2.4, h = 1.00

119) stlb = lmt + 3q + 3H2O (Liou, 1971)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	2.0		178		171.15	12	190	8	5 (171.50 <-> 173.34)
0	0	3.0	170	198	170.46	173.40		189	8	cH = 172.42 (sd 1.39) 2
0	0	4.0	175	205	171.28	174.39		186	8	within bracket
0	0	5.0	173	195	171.55	173.73		182	8	uH = 0.51, d/s = -0.4, h = 1.00

120) 3cc + an + cor = 2geh + 3CO2 (Shmulovich, 1974)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	1	0.5	790	830	367.83	380.35		820	10	1 (372.47 <-> 377.60)
0	1	0.7	835	855	372.03	378.04		852	12	cH = 377.18 (sd 1.68) 2
										within bracket
										uH = 1.62, d/s = 1.9, h = 0.10

121) 2cc + an = wo + geh + 2CO2 (Shmulovich, 1974)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	1	0.5	840	860	236.13	239.91	4	864	10	2 (236.02 <-> 238.84)
0	1	0.7	870	890	235.11	238.74	11	901	10	cH = 240.71 (sd 0.89) 2
										too high
										uH = 1.01, d/s = 1.3, h = 0.12

* wo + cc + an = gr + CO2 (Hoschek, 1974)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0.37	1.0	715		38.38		-37	678	28	** NOT USED **
0	0.30	1.0		735		40.24		631	26	cH = 37.49 (sd 0.34)
0	0.52	1.0	815		38.10		-33	782	36	
0	0.45	1.0		835		39.59		732	32	
0	0.13	4.0	715		40.00		-111	604	30	
0	0.10	4.0		735		42.24		549	26	
0	0.23	4.0	815		37.90		-30	785	48	
0	0.18	4.0		835		39.96		691	36	

* an + cor + 3cc = 2geh + 3CO_2 (Hoschek, 1974)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0.31	1.0	765		367.08			796	10	** NOT USED **
0	0.27	1.0		785		376.61	2	787	10	cH = 377.18 (sd 1.68)
0	0.63	1.0	815		367.31			848	12	
0	0.56	1.0		835		376.23	3	838	10	

* 2an + 3cc = geh + gr + 3CO_2 (Hoschek, 1974)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0.42	1.0	790		266.73			844	10	** NOT USED **
0	0.34	1.0		810		275.70	11	821	10	cH = 278.20 (sd 1.08)

* an + 2cc = geh + wo + 2CO_2 (Hoschek, 1974)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0.64	1.0	840		230.49			896	10	** NOT USED **
0	0.57	1.0		865		237.01	20	885	10	cH = 240.71 (sd 0.89)
0	0.85	1.0	860	895	229.16	235.35	31	926	10	

* 2zo + CO_2 = 3an + cc + H_2O (Allen & Fawcett, 1982)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0.07	5.0	590		38.09			652	16	** NOT USED **
0	0.08	5.0		610		39.85	22	632	14	cH = 40.86 (sd 0.34)
0	0.16	5.0	492		37.91			548	12	
0	0.19	5.0		505		39.39	27	532	12	
0	0.11	5.0	540		38.46			589	14	
0	0.12	5.0		560		39.93	19	579	14	

122) cc + q + and = an + CO_2 (Chernosky & Berman, 1991)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0.74	1.0	338	366	80.19	83.50		338	6	3 (81.85 <-> 83.58)
0	0.68	2.0	392	412	81.86	84.10	-15	377	6	cH = 80.19 (sd 0.35) 2
0	0.53	2.0		399		83.53		370	6	too low
0	0.82	2.0		409		82.91		384	6	uH = 0.62, d/s = 0.5, h = 0.04
0	0.17	2.0	364		82.27		-16	348	6	
0	0.21	2.0		379		83.57		352	6	

* cc + q + and = an + CO_2 (Jacobs & Kerrick, 1981)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0.27	2.0	390	410	84.26	86.69	-33	357	6	** NOT USED **
0	0.69	2.0	440	460	87.15	89.37	-62	378	6	cH = 80.19 (sd 0.35)

* cc + q + ky = an + CO_2 (Jacobs & Kerrick, 1981)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0.17	6.0	490	510	85.80	88.31	-10	480	6	** NOT USED **
0	0.75	6.0	565	585	89.06	91.20	-42	523	6	cH = 84.55 (sd 0.35)

$MgO–Al_2O_3–SiO_2$

123) per + cor = sp (Chamberlin et al., 1995)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
2.78	-	0.0	1200	-24.92	-23.06		2.74	0.05	1 (-24.85 <-> -23.80)
2.86	-	0.0	1200	-27.51	-22.46		2.74	0.05	cH = -23.48 (sd 0.31)
2.95	-	0.0	1250	-29.68	-23.73	-0.02	2.69	0.05	too high but OK
2.82	-	0.0	1300	-28.32	-23.08		2.65	0.05	uH = 0.36, d/s = 1.7, h = 0.17

124) 3en + 2cor = 2py (Gasparik & Newton, 1984)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0.35	-	16.0 16.5	850	52.11	52.72		16.49	0.74	2 (51.59 <-> 53.24)
									cH = 52.71 (sd 0.46)
									within bracket
									uH = 0.70, d/s = 0.4, h = 0.34

125) 2py + 2q = 3en + 2sill (Perkins, 1983)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-0.45	-	17.2 16.0	1000	-53.26	-51.21		16.55	0.60	3 (-54.25 <-> -52.20)
-0.63	-	18.0 16.9	1150	-54.23	-52.24		16.67	0.59	cH = -52.35 (sd 0.47) 2
-0.82	-	19.1 18.5	1300	-54.44	-53.08	-0.88	17.62	0.59	within bracket
									uH = 0.87, d/s = 0.1, h = 0.12

* 2py + 2q = 3en + 2sill (Hensen & Essene, 1971)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-0.45	-	15.3 14.4	1000	-50.60	-49.33	1.25	16.55	0.60	** NOT USED **
-0.56	-	16.2 14.4	1100	-52.01	-49.46	0.24	16.44	0.59	cH = -52.35 (sd 0.47)
-0.75	-	17.1 16.2	1200	-52.02	-50.74	0.23	17.33	0.59	
-0.99	-	19.8 18.9	1400	-53.49	-52.21		19.00	0.59	

126) fo + py = sp + 2en (Dankwerth & Newton, 1978; Gasparik & Newton, 1984)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-0.19	-	18.8 18.0	900	-25.10	-24.49		18.35	0.42	3 (-25.17 <-> -23.91)
-0.23	-	19.2 18.4	950	-24.92	-24.31		18.99	0.42	cH = -24.76 (sd 0.16)
-0.26	-	19.6 18.9	1000	-24.89	-24.35		19.43	0.42	within bracket
-0.28	-	20.1 19.5	1050	-24.87	-24.41		19.96	0.42	uH = 0.54, d/s = 0.2, h = 0.45
-0.30	-	20.6 19.7	1100	-24.79	-24.10		20.56	0.42	
-0.35	-	22.0 21.2	1200	-24.75	-24.15	0.01	22.01	0.43	
-0.49	-	29.9 29.0	1600	-24.87	-24.22		29.74	0.44	

127) en + sp = mgts + fo (Gasparik & Newton, 1984)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-1.90	-	19.0	1020 1040	29.25	29.63	14	1054	12	4 (29.24 <-> 30.48)
-1.52	-	10.2	1290 1310	29.89	30.21		1290	14	cH = 29.89 (sd 0.12)
-1.45	-	19.9	1390 1410	29.90	30.20		1390	16	within bracket
-1.39	-	11.8	1390 1410	29.59	29.89		1410	16	uH = 0.37, d/s = -0.6, h = 0.86
-1.32	-	21.7	1490 1510	29.47	29.75	10	1520	16	
-1.32	-	13.8	1490 1510	30.06	30.35	-11	1479	16	
-1.27	-	25.7	1590 1610	29.69	29.97		1604	18	
-1.27	-	21.8	1590 1610	29.98	30.27	-7	1583	18	
-2.20	-	18.5	890 910	29.71	30.14		898	12	
-1.99	-	19.3	990 1010	29.64	30.03		1003	12	
-1.27	-	29.5	1590 1610	29.42	29.70	14	1624	18	

128) en + mgts = py (Perkins et al., 1981)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
3.54	-	31.0 33.0	900	-6.53	-5.04		32.87	0.47	3 (-6.03 <-> -4.48)
2.81	-	29.0 31.0	1100	-6.17	-4.63		30.34	0.45	cH = -5.13 (sd 0.17)
3.47	-	39.0 41.0	1100	-6.21	-4.76		40.48	0.48	within bracket
2.42	-	21.0 23.0	1000	-5.60	-4.00		21.58	0.44	uH = 0.64, d/s = 0.2, h = 0.44
2.12	-	20.0 22.0	1100	-5.38	-3.76		20.31	0.43	
2.01	-	26.0 28.0	1400	-6.33	-4.73		27.49	0.44	
2.25	-	34.0 36.0	1500	-6.18	-4.64		35.35	0.45	
2.01	-	34.0 36.0	1600	-5.35	-3.80		34.28	0.45	
2.41	-	17.5 19.5	900	-6.08	-4.46		18.66	0.43	
2.25	-	18.3 20.3	1000	-5.99	-4.37		19.36	0.43	
1.76	-	28.5 30.5	1600	-5.90	-4.30		29.45	0.44	

129) 5en + 2sp = 5fo + crd (Herzberg, 1983)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0.84	-	2.2 1.8	1150	28.00	30.26		2.02	0.22	3 (28.22 <-> 31.19)
0.90	-	2.0 1.6	1200	28.52	30.78		1.91	0.22	cH = 29.03 (sd 0.60)
1.02	-	1.7 1.3	1300	28.71	30.97		1.64	0.22	within bracket
									uH = 1.26, d/s = 0.6, h = 0.41

130) 5en + 2sp = crd + 5fo (Seifert, 1974)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0.55	-	3.3 2.8	905	29.07	31.15	0.01	3.31	0.22	3 (28.83 <-> 31.49)
0.67	-	3.2 2.7	1000	28.87	30.95		3.16	0.22	cH = 29.03 (sd 0.60) 2
0.78	-	2.9 2.4	1100	29.13	31.21	0.02	2.92	0.22	within bracket
									uH = 1.12, d/s = 0.8, h = 0.13

131) en + 3sill = crd + cor (Newton, 1972)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0.12	-	10.5 10.0	825	9.32	10.65	0.08	10.58	0.17	2 (9.78 <-> 11.22)
0.14	-	10.5 10.0	875	10.35	11.68	0.47	10.97	0.17	cH = 9.10 (sd 0.37) 2
									too low but OK
									uH = 0.59, d/s = 0.2, h = 0.10

132) en + 2sill + q = crd (Newton, pers comm)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0.17	-	7.4 6.8	950	9.65	12.33	0.08	7.48	0.16	1 (9.87 <-> 12.11)
									cH = 9.28 (sd 0.36)
									too low but OK
									uH = 0.68, d/s = 2.0, h = 0.08

133) clin = en + fo + sp + 4H2O (Baker & Holland, 1996)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0.02	0	14.0	845 860	401.32	404.61	-5	840	4	1 (401.37 <-> 404.56)
									cH = 400.19 (sd 0.43)
									too low
									uH = 1.19, d/s = 1.4, h = 0.06

134) ames = en + 2sp + 4H2O (Baker & Holland, 1996)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
1.88	0	14.0	845 860	394.00	397.29		849	6	1 (394.04 <-> 397.25)
									cH = 394.92 (sd 0.65)
									within bracket
									uH = 1.20, d/s = 1.4, h = 0.13

135) afchl = en + 2fo + 4H2O (Baker & Holland, 1996)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
3.77	0	14.0	780	359.40	379.62	-1.87	6.80	0.12	5 (344.95 <-> 349.03)
6.82	0	14.0	800	343.70	348.69	-0.08	7.18	0.12	cH = 342.99 (sd 0.51) 2
7.47	0	14.0	840	344.40	349.58	-0.15	7.90	0.11	too low
									uH = 0.98, d/s = -5.5, h = 0.03

136) afchl = en + 2fo + 4H2O (Baker & Holland, 1996)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
7.81	0	10.0	800	340.51	345.07		7.78	0.12	5 (340.53 <-> 344.52)
7.50	0	12.0	800	339.98	344.98		7.45	0.12	cH = 342.99 (sd 0.51) 2
7.28	0	14.0	800	339.51	344.75		7.18	0.12	within bracket
6.23	0	16.0	800	337.59	361.51		6.97	0.12	uH = 0.92, d/s = -0.2, h = 0.04
4.91	0	18.0	800	345.13	374.35	-0.24	6.79	0.12	

137) 2ames = afchl + 2cor + 2sp + 4H2O (Baker & Holland, 1996)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-6.33	0	14.0	780	438.14	442.09	-0.16	-6.71	0.25	1 (438.16 <-> 442.07)
-5.77	0	14.0	800	435.63	445.67		-6.08	0.24	cH = 443.49 (sd 1.07) 2
-5.05	0	14.0	820	436.55	442.71	-0.09	-5.48	0.24	too high but OK
									uH = 1.49, d/s = 1.3, h = 0.11

138) 2ames = afchl + 2cor + 2sp + 4H2O (Baker & Holland, 1996)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-5.97	0	12.0	800	444.15	446.69	-0.07	-5.75	0.24	3 (443.00 <-> 446.51)
-5.66	0	14.0	800	435.63	443.73		-6.08	0.24	cH = 443.49 (sd 1.07) 2
-6.52	0	16.0	800	443.16	446.54		-6.37	0.24	within bracket
									uH = 1.49, d/s = -0.1, h = 0.17

139) 4clin = 3afchl + 2cor + 2sp + 4H2O (Baker & Holland, 1996)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-26.04	0	14.0	780	564.78	563.67	-0.45	-26.54	0.25	** NOT USED **
-25.39	0	14.0	800	568.86	563.80		-25.65	0.25	cH = 568.68 (sd 1.11)
-24.40	0	14.0	820	567.54	562.79	-0.13	-24.79	0.24	

* clin = en + fo + sp + 4H2O (Fawcett & Yoder, 1966)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0.03	0	3.0	725 755	399.88	408.23		726	4	** NOT USED **
0.02	0	5.0	770 790	403.00	408.15	-11	759	4	cH = 400.19 (sd 0.43)
0	0	10.0	815 840	401.10	406.89	-4	811	4	

140) clin = en + fo + sp + 4H2O (Jenkins, 1981; Jenkins & Chernosky, 1986)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0.03	0	6.1	775 790	400.49	404.24	-1	774	4	3 (402.29 <-> 405.37)
0.02	0	8.0	810 820	404.01	406.41	-16	794	4	cH = 400.19 (sd 0.43) 2
0.02	0	12.0	840 850	403.12	405.37	-13	827	4	too low
0.02	0	14.0	850 860	402.42	404.61	-10	840	4	uH = 1.31, d/s = 0.1, h = 0.07

141) clin + 2cor = py + 2sp + 4H2O (Ackermand & Seifert, 1975)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0.20	0	23.0	850 925	426.13	442.77		859	6	1 (426.60 <-> 430.64)
0.20	0	25.0	875		431.27		861	6	cH = 428.14 (sd 0.62) 2
0.20	0	26.0	825 875	420.17	431.12		861	6	within bracket
									uH = 1.12, d/s = 2.2, h = 0.00

142) 2mcar = sud + q (Vidal et al., 1992)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
-0.30	-	7.6 6.9	350		36.78	37.72	-4.75	2.15	0.99	4 (42.86 <-> 45.45)
-0.30	-	7.7 6.5	400		43.35	44.96		7.10	1.02	cH = 44.15 (sd 0.66)
-0.30	-	6.3	500		59.90		-108	392	10	within bracket
-0.30	-	7.0		475		55.15		399	10	uH = 0.78, d/s = -14.3, h = 1.00

* 2clin = py + 3fo + sp + 8H2O (Staudigel & Schreyer, 1977)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0.33	0	20.4	890	900	833.46	837.53	-20	870	4	** NOT USED **
0.33	0	23.3	890	900	831.11	835.09	-15	875	4	cH = 825.14 (sd 0.87)
0.33	0	28.0	875	880	823.03	824.96		880	4	
0.33	0	32.6	870	880	820.33	824.08	3	883	6	

143) 3clin + 14q = 3ky + 5ta + 7H2O (Massonne et al., 1981)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
-0.65	0	11.0	600	630	573.94	583.18	7	637	10	5 (567.47 <-> 572.79)
-0.42	0	15.0	560	580	567.15	573.12	41	621	12	cH = 585.28 (sd 1.63) 2
-0.26	0	20.0	480		554.87			586	12	too high
										uH = 1.80, d/s = -0.2, h = 0.11

144) 2clin + 3en = 7fo + crd + 8H2O (Jenkins & Chernosky, 1986)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0.20	0	0.5	595	612	813.71	826.75	3	615	2	3 (824.08 <-> 833.25)
0.23	0	1.0	634	660	817.21	834.86		652	2	cH = 829.41 (sd 1.01) 2
0.27	0	2.0	690	705	828.02	837.11		692	4	within bracket
0.29	0	3.0	720	734	828.24	836.23		722	4	uH = 3.51, d/s = -0.2, h = 0.03

145) 5clin + crd = 10en + 7sp + 20H2O (Jenkins & Chernosky, 1986)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0.01	0	3.5	733		1967.41			736	4	3 (1947.85 <-> 1967.34)
0.01	0	3.0		740		1988.16		728	4	cH = 1971.92 (sd 2.30) 2
0.12	0	4.0	730		1953.19			744	4	too high but OK
0.12	0	4.7		750		1968.06	3	753	4	uH = 6.98, d/s = 0.0, h = 0.01
0.12	0	5.0	744		1956.16			756	4	

146) 5clin = 10fo + 3sp + crd + 20H2O (Chernosky, 1974; McPhail et al., 1990)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0.36	0	0.5	605	640	1993.02	2059.15		625	2	3 (2024.68 <-> 2043.91)
0.42	0	1.0	644	670	2001.05	2044.56		661	2	cH = 2029.98 (sd 2.19) 2
0.42	0	2.0	690	704	2016.92	2037.81		699	2	within bracket
0.42	0	1.0	636	662	1987.71	2031.15		661	2	uH = 8.16, d/s = -1.0, h = 0.03
0.42	0	2.0	710	719	2046.76	2060.21	-11	699	2	
0.42	0	3.0	726	750	2031.92	2065.63	-1	725	4	

* 6clin + 29q = 8ta + 3crd + 16H2O (Chernosky, 1978)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
-0.84	0	2.0	504	540	1396.27	1436.36	21	561	6	** NOT USED **
-0.93	0	3.0	536	552	1411.09	1428.12	30	582	6	cH = 1459.51 (sd 3.18)
-1.12	0	4.0	572	596	1432.05	1456.62	3	599	6	

147) 6clin + 29q = 8ta + 3crd + 16H2O (Massonne, 1989)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
-0.90	0	2.0	547	557	1444.57	1455.69	3	560	6	3 (1443.93 <-> 1457.08)
-1.06	0	4.0	580	600	1439.80	1460.23		599	6	cH = 1459.51 (sd 3.18) 2
-1.28	0	6.0	616	626	1446.47	1456.18	3	629	6	too high but OK
										uH = 5.58, d/s = 0.8, h = 0.12

148) 2ta + 6sill + q = 3crd + 2H2O (Newton, 1972)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0.47	0	8.5 7.2	670	235.17	246.99		7.36	0.15	3 (239.72 <-> 244.75)
0.47	0	9.0 8.5	700	237.38	241.87	-0.40	8.10	0.16	cH = 245.52 (sd 1.10) 2
0.47	0	9.9 9.4	750	240.48	244.92	-0.07	9.33	0.16	too high but OK
0.47	0	11.0 10.3	800	241.87	248.02		10.58	0.16	uH = 2.09, d/s = -0.0, h = 0.11

149) 2ta + 6ky + q = 3crd + 2H2O (Massonne & Schreyer, 1989)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0.45	0	6.7 6.0	625	284.07	292.94		6.31	0.13	1 (284.82 <-> 292.19)
									cH = 288.94 (sd 1.13) 2
									within bracket
									uH = 2.21, d/s = 2.0, h = 0.02

150) 2clin + 8ky + 11q = 5crd + 8H2O (Seifert & Schreyer, 1970)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0.28	0	4.0	550 600	864.54	901.90		560	4	3 (869.46 <-> 880.36)
0.28	0	5.0	550 600	841.97	878.75		590	4	cH = 871.76 (sd 1.94) 2
0.28	0	6.0	620 640	871.21	885.61		621	4	within bracket
0.28	0	7.0	650 660	871.31	878.41		651	4	uH = 4.63, d/s = 0.8, h = 0.05

151) 2clin + 8and + 11q = 5crd + 8H2O (Seifert & Schreyer, 1970)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0.33	0	2.0	490 520	822.62	844.11		510	4	3 (832.98 <-> 841.62)
0.33	0	3.0	530 550	831.38	845.24		538	6	cH = 836.90 (sd 1.91) 2
0.33	0	4.0	560 570	833.93	840.68		564	6	within bracket
0.33	0	5.0	580 600	830.46	843.69		590	6	uH = 3.67, d/s = 0.9, h = 0.10
0.33	0	6.0	600 630	827.66	847.15		614	6	

152) 2clin + 19and = 5crd + 11cor + 8H2O (Seifert, 1973)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0.45	0	2.0	520 570	851.73	888.18		540	4	3 (863.68 <-> 872.32)
0.42	0	3.0	560 570	863.66	870.70		564	6	cH = 866.61 (sd 1.93) 2
0.40	0	4.0	580 600	862.59	876.32		586	6	within bracket
0.37	0	5.0	600 620	862.55	875.99		606	6	uH = 3.67, d/s = 0.8, h = 0.14
0.33	0	6.0	620 640	863.40	876.62		625	6	
0.30	0	7.0	640 655	864.62	874.40		643	6	

153) 2clin + 19sill = 5crd + 11cor + 8H2O (Seifert, 1973)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0.45	0	3.0	560 570	808.72	815.23		565	6	3 (803.59 <-> 812.04)
0.35	0	5.0	600 620	798.65	811.00	1	621	6	cH = 811.87 (sd 1.97) 2
0.33	0	6.0	640 650	806.72	812.76		649	6	within bracket
0.30	0	7.0	655 670	800.00	808.90	5	675	6	uH = 3.59, d/s = 0.0, h = 0.15

154) 2clin + 19ky = 5crd + 11cor + 8H2O (Seifert, 1973)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0.33	0	5.0	610 620	953.78	962.21	-5	605	4	6 (949.69 <-> 962.12)
0.33	0	6.0	640 650	951.75	960.05	-3	637	4	cH = 949.40 (sd 2.10) 2
0.33	0	7.0	655 670	937.78	950.07		669	4	too low but OK
									uH = 5.27, d/s = -0.4, h = 0.07

* 5clin + 20cor = 3crd + 19sp + 20H2O (Seifert, 1974)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0.70	0	1.0	680 690	2215.77	2234.64	-51	629	4	** NOT USED **
0.70	0	2.0	705 720	2187.41	2212.98	-40	665	4	cH = 2120.01 (sd 4.18)
0.70	0	4.0	740 750	2154.62	2170.24	-22	718	6	
0.70	0	6.0	740 780	2088.41	2147.94		761	6	

155) clin + 2mag = 3fo + sp + 2CO2 + 4H2O (Chernosky & Berman, 1986)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0.12	0.50	1.0	555	565	577.78	583.45		564	2	3 (577.35 <-> 583.95)
0.12	0.50	2.0	600		582.15			601	2	cH = 582.91 (sd 0.62) 2
0.12	0.50	3.0	625		580.83			629	2	within bracket
0.11	0.50	4.0	645	665	579.39	589.08		652	2	uH = 2.80, d/s = 0.2, h = 0.01

156) 3mctd = py + 2cor + 3H2O (Chopin & Schreyer, 1983)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	29.0	750	770	316.89	320.77		759	12	1 (317.02 <-> 319.80)
0	0	33.0	750	770	316.10	319.93		763	12	cH = 318.54 (sd 1.12)
										within bracket
										uH = 0.97, d/s = 1.6, h = 0.75

157) 8mctd + 3cor + 7ky = 2mst + 4H2O (Schreyer, 1968)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	23.0	680	720	470.52	483.89		709	22	1 (478.12 <-> 483.50)
0	0	32.0	680	720	477.73	491.53		687	20	cH = 480.26 (sd 3.40)
										within bracket
										uH = 1.77, d/s = 1.7, h = 0.61

158) 8clin + 51ky + 31cor = 10mst + 12H2O (Massonne, 1995)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0.41	0	25.0	710	730	1691.67	1709.80	-5	705	38	1 (1690.52 <-> 1710.96)
										cH = 1686.68 (sd 16.75) 2
										too low but OK
										uH = 8.47, d/s = 1.1, h = 0.52

159) 25ta + 12mst = 67ky + 41py + 49H2O (Chopin & Sobolev, 1995)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
4.96	0	17.0	765	795	5438.40	5527.60	-7	758	14	1 (5464.71 <-> 5521.27)
2.36	0	30.0	700	730	5458.39	5536.85	-15	685	18	cH = 5418.32 (sd 21.11) 2
										too low
										uH = 16.20, d/s = 2.1, h = 0.16

160) 3mcar + q = ta + 3ky + 5H2O (Chopin & Schreyer, 1983)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
-0.08	0	19.0	540	560	407.86	413.31		546	10	3 (407.49 <-> 411.33)
-0.06	0	24.0	550	570	406.41	411.69		562	10	cH = 409.62 (sd 1.35)
-0.05	0	28.5	560	580	406.20	411.36		573	12	within bracket
										uH = 1.38, d/s = 1.3, h = 0.85

161) 14mcar = clin + 13ky + 3ta + 21H2O (Chopin & Schreyer, 1983)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
-0.30	0	18.0	535	560	1712.86	1742.44		538	12	3 (1710.81 <-> 1727.88)
-0.24	0	24.0	560		1712.80			563	12	cH = 1716.49 (sd 6.30) 2
-0.21	0	28.5	565	590	1700.65	1728.51		579	12	within bracket
										uH = 6.11, d/s = 1.3, h = 0.12

162) 5mcar = clin + 4ky + 3q + 6H2O (Chopin & Schreyer, 1983)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
-0.09	0	14.5		510		490.76		501	12	3 (489.39 <-> 495.01)
-0.04	0	16.5	515	550	486.97	499.64		517	14	cH = 487.61 (sd 2.30) 2
0	0	19.0	539		489.18		-4	535	14	too low but OK
-0.01	0	18.0		564		500.68		528	14	uH = 2.01, d/s = 0.4, h = 0.04

163) 2ta + 3ky + H2O = 3tats + 2q (Hoschek, 1995)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-11.47	0	10.5	650	24.93			707	36	3 (28.86 <-> 31.99)
-11.47	0	9.5	690		31.31		681	36	cH = 30.42 (sd 1.78)
-12.87	0	15.5	680	26.20			718	32	within bracket
-12.87	0	14.5	720		33.19		695	32	uH = 1.12, d/s = 0.3, h = 1.00
-14.63	0	20.5	705	30.59		-1	704	28	
-14.63	0	19.5	745		38.23		684	28	

164) 2py + 6sp + 4cor = 3spr4 (Akermand et al., 1975; Doroshev & Malinovskiy, 1974)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-0.32	-	21.6 20.7	950	21.14	23.54	-1.98	18.72	0.76	3 (23.25 <-> 26.73)
-0.42	-	23.4 19.8	1000	18.98	28.59	-0.11	19.69	0.76	cH = 28.88 (sd 1.03) 2
-0.52	-	23.4 20.7	1050	21.62	28.84	-0.01	20.69	0.76	too high
-0.71	-	25.7 22.1	1150	20.58	30.15		22.57	0.76	uH = 1.48, d/s = -0.8, h = 0.33
-0.82	-	25.8 24.8	1200	23.13	25.77	-1.17	23.63	0.77	
-0.94	-	27.5 25.6	1250	21.56	26.55	-0.88	24.72	0.77	
-1.16	-	27.9 26.1	1350	26.00	30.74		26.80	0.78	
-1.25	-	29.5 27.6	1400	24.36	29.33		27.77	0.78	

165) 6py = 7en + spr4 + 2sill (Hensen, 1972)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-2.45	-	16.5 15.5	1200	-115.67	-110.03		15.91	0.38	1 (-115.92 <-> -109.77)
-3.39	-	20.0 18.0	1400	-119.31	-108.11		18.75	0.38	cH = -112.32 (sd 1.06) 2
									within bracket
									uH = 2.50, d/s = 1.1, h = 0.03

166) 5spr4 = 2crd + 16sp (Seifert, 1974)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0.26	-	4.0 3.5	790	-67.50	-63.95	-0.28	3.22	0.29	5 (-65.00 <-> -61.78)
0.42	-	4.0 3.2	900	-66.45	-60.84		3.36	0.29	cH = -61.94 (sd 1.46) 2
0.53	-	3.7 3.5	955	-63.82	-62.43	-0.07	3.43	0.30	within bracket
0.93	-	3.4 3.2	1105	-60.58	-59.20	0.20	3.60	0.30	uH = 1.14, d/s = -1.5, h = 0.79

167) 2clin + 8cor + 2sp = 3spr4 + 8H2O (Seifert, 1974)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-0.12	0	2.0	680 700	892.53	906.09	-11	669	6	3 (887.29 <-> 895.12)
-0.12	0	3.0	700 730	891.19	910.46	-9	691	6	cH = 885.17 (sd 1.73) 3
-0.12	0	4.0	700 720	880.08	892.48		708	6	too low but OK
-0.12	0	5.0	730 760	889.09	907.13	-7	723	6	uH = 3.32, d/s = -0.9, h = 0.06
-0.12	0	6.0	730 740	880.94	886.82		737	6	
-0.12	0	7.0	740 760	879.56	891.09		750	6	

168) 16clin + 64cor = 2crd + 19spr4 + 64H2O (Seifert, 1974)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-0.20	0	2.0	680 690	7072.67	7127.02	-10	670	4	3 (7063.09 <-> 7124.20)
-0.20	0	4.0	710 730	7002.34	7101.78		713	6	cH = 7019.38 (sd 13.47) 3
-0.20	0	5.0	740 750	7063.22	7111.52	-9	731	6	too low
-0.20	0	6.0	760 775	7081.05	7151.77	-13	747	6	uH = 25.94, d/s = 0.4, h = 0.05

169) 16clin + 6crd = 32en + 7spr4 + 64H2O (Seifert, 1974)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-1.69	0	4.0	760 770	6531.20	6572.98	-32	728	4	2 (6484.01 <-> 6533.79)
-1.69	0	7.0	755 765	6448.26	6486.60	-13	742	4	cH = 6396.87 (sd 7.57) 3
									too low
									uH = 21.13, d/s = -1.1, h = 0.02

* 2clin + 8cor + 2sp = 3spr4 + 8H2O (Akermand et al., 1975)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0.09	0	10.0	700	800	838.02	892.93		786	6	** NOT USED **
0.09	0	13.0	750	800	851.42	877.85	14	814	6	cH = 885.17 (sd 1.73)
0.09	0	15.0	775	840	856.35	889.86		831	6	
0.09	0	19.0	835	870	872.01	889.31		862	8	
0.09	0	23.0	870	900	875.94	890.25		889	8	
0.09	0	25.0	900		884.07			902	8	

170) py + 4sp + 4cor = 2spr7 (Akermand et al., 1975; Doroshev & Malinovskiy, 1974)

ln_K	x(CO2)	P(kbar)		T(C)	H(low)	H(high)	miss	calc	2sd	summary
-0.21	-	21.6	20.7	950	46.74	48.49	-1.89	18.81	0.81	3 (48.42 <-> 50.80)
-0.17	-	23.4	19.8	1000	45.29	52.28		19.84	0.81	cH = 52.20 (sd 0.80) 2
-0.12	-	23.4	20.7	1050	47.22	52.47		20.84	0.81	too high but OK
-0.06	-	25.7	22.1	1150	46.71	53.67		22.85	0.82	uH = 1.01, d/s = -0.9, h = 0.38
-0.04	-	25.8	24.8	1200	48.49	50.41	-0.92	23.88	0.82	
-0.02	-	27.5	25.6	1250	47.16	50.79	-0.73	24.87	0.82	
0	-	27.9	26.1	1350	50.31	53.76		26.91	0.83	
0	-	29.5	27.6	1400	49.29	52.91		27.97	0.83	

171) 13py = 16en + 2spr7 + 4sill (Hensen, 1972)

ln_K	x(CO2)	P(kbar)		T(C)	H(low)	H(high)	miss	calc	2sd	summary
-4.84	-	16.5	15.5	1200	-233.52	-221.22		15.96	0.38	1 (-234.17 <-> -220.57)
-6.65	-	20.0	18.0	1400	-241.46	-217.03		18.80	0.38	cH = -226.83 (sd 2.30) 2
										within bracket
										uH = 5.58, d/s = 1.1, h = 0.03

172) 2spr7 + en = crd + 7sp (Seifert, 1974)

ln_K	x(CO2)	P(kbar)		T(C)	H(low)	H(high)	miss	calc	2sd	summary
0.29	-	4.0	3.5	790	-42.94	-41.22		3.59	0.26	3 (-42.80 <-> -41.53)
0.32	-	4.0	3.2	900	-43.66	-40.95		3.37	0.26	cH = -41.53 (sd 0.64) 2
0.33	-	3.7	3.5	955	-42.88	-42.21	-0.20	3.30	0.27	within bracket
0.37	-	3.4	3.2	1105	-42.22	-41.55	-0.00	3.20	0.27	uH = 0.54, d/s = 0.0, h = 0.72

173) clin + 6cor + 2sp = 2spr7 + 4H2O (Seifert, 1974)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
-0.03	0	2.0	680	700	484.77	492.27	-12	668	6	3 (481.77 <-> 486.15)
-0.03	0	3.0	700	730	484.14	494.85	-11	689	6	cH = 480.34 (sd 1.14) 3
-0.03	0	4.0	700	720	477.92	484.83		707	6	too low but OK
-0.03	0	5.0	730	760	482.82	492.91	-7	723	6	uH = 1.86, d/s = -0.9, h = 0.08
-0.03	0	6.0	730	740	478.08	481.38		737	6	
-0.03	0	7.0	740	760	477.09	483.56		750	8	

174) 29clin + 154cor = 6crd + 38spr7 + 116H2O (Seifert, 1974)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0.45	0	2.0	680	690	13475.57	13581.09	-10	670	6	3 (13430.89 <-> 13556.01)
0.45	0	4.0	710	730	13318.93	13513.20		715	6	cH = 13366.51 (sd 29.04) 3
0.45	0	5.0	740	750	13425.38	13519.96	-6	734	6	too low
0.45	0	6.0	760	775	13446.92	13585.63	-9	751	6	uH = 53.09, d/s = 0.4, h = 0.07

175) 5clin + 20spr7 = 9crd + 77sp + 20H2O (Seifert, 1974)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
2.58	0	2.0	700	710	1570.74	1584.72	-10	690	10	4 (1543.93 <-> 1573.28)
2.58	0	3.0		730		1533.18	18	748	10	cH = 1556.58 (sd 6.88) 3
2.58	0	4.0	760	780	1502.33	1528.06	22	802	10	within bracket
										uH = 8.82, d/s = -2.4, h = 0.10

176) 5clin + 2crd = 11en + 2spr7 + 20H2O (Seifert, 1974)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-0.86	0	4.0	760 770	2056.18	2069.39	-32	728	4	2 (2042.13 <-> 2057.95)
-0.86	0	7.0	755 765	2031.77	2043.90	-15	740	4	cH = 2013.46 (sd 2.38) 3
									too low
									uH = 6.71, d/s = -0.9, h = 0.02

* clin + 6cor + 2sp = 2spr7 + 4H2O (Akermand et al., 1975)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-0.05	0	10.0	700 800	453.95	485.02		785	8	** NOT USED **
-0.12	0	13.0	750 800	461.12	476.15	14	814	8	cH = 480.34 (sd 1.14)
-0.16	0	15.0	775 840	463.64	482.77		832	8	
-0.28	0	19.0	835 870	472.30	482.26		863	8	
-0.36	0	23.0	870 900	473.88	482.16		893	8	
-0.41	0	25.0	900	478.40			907	8	

177) 2ged + 6ky + 7q = 5crd + 2H2O (Schreyer & Seifert, 1969)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
3.93	0	11.0 10.0	850	264.90	280.85		10.50	1.19	1 (266.40 <-> 279.35)
									cH = 272.88 (sd 14.75) 2
									within bracket
									uH = 3.63, d/s = 2.2, h = 1.00

CaO–MgO–Al_2O_3–SiO_2

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178)  ts + 2di + 2q = tr + 2an    (Jenkins, 1994)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss   calc   2sd        summary
  5.76     -       2.0       607      -23.42   -6.41           4.99  0.62   1 (-9.49 <-> -6.76)
  5.47     -       2.0       698      -22.01   -6.06           4.88  0.56   cH = -9.28 (sd  2.27) 2
  4.85     -       2.0       797      -16.57   -3.28           4.77  0.51   within bracket
  3.93     -       4.5       674      -12.54   -3.54           4.09  0.58   uH = 0.45, d/s = 3.8, h = 0.23
  3.81     -       4.5       776      -11.58   -2.58           4.06  0.52
  2.93     -       7.0       650       -9.84   -3.91           3.24  0.59
  3.10     -       7.0       750      -14.11   -0.72           3.32  0.53

179)  ts + 2fo = tr + 2sp    (Jenkins, 1994)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss   calc   2sd        summary
  1.56     -       5.9       789      -29.54  -25.39           1.40  0.50   1 (-26.41 <-> -25.49)
  1.41     -       6.1       800      -28.31  -24.35           1.38  0.49   cH = -26.07 (sd  2.19) 2
  1.25     -       8.0       827      -26.50  -22.67           1.41  0.48   within bracket
                                                                           uH = 0.27, d/s = 2.0, h = 0.67

180)  5ts + 7q = 3tr + 7ky + 2zo + H2O    (Hoschek, 1995)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss   calc   2sd        summary
  8.60     0      10.0       700      -68.46  -29.17           7.63  2.71   1 (-67.49 <-> -39.95)
 13.96     0      15.0       720      -75.41  -38.98          12.00  2.66   cH = -41.00 (sd  10.98) 2
 17.05     0      20.0       740      -80.98  -16.96          16.10  2.61   within bracket
                                                                           uH = 2.41, d/s = 6.1, h = 0.13

181)  clin + 2dol = 3fo + 2cc + sp + 4H2O + 2CO2    (Chernosky & Berman, 1986)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss   calc   2sd        summary
 -0.04  0.43       1.0    565  585   585.76  597.14           579     4   1 (586.68 <-> 596.22)
                                                                         cH = 593.77 (sd  0.95) 2
                                                                         within bracket
                                                                         uH = 2.92, d/s = 2.0, h = 0.01

182)  3clin + 2cc = 2di + 5fo + 3sp + 2CO2 + 12H2O    (Chernosky & Berman, 1986)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss   calc   2sd        summary
  0.09  0.20       1.0    588  608  1326.59 1350.63           608     2   1 (1328.55 <-> 1348.67)
                                                                         cH = 1350.63 (sd  1.56) 2
                                                                         too high but OK
                                                                         uH = 6.12, d/s = 2.0, h = 0.00

183)  25pump = 29cz + 14gr + 5clin + 6q + 53H2O    (Schiffman & Liou, 1980)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss   calc   2sd        summary
 -0.26     0       5.0    360  380  3809.74 3859.71   -15     345     6   4 (3746.78 <-> 3790.19)
 -0.26     0       6.0    359  365  3760.85 3776.12           362     6   cH = 3768.50 (sd  11.24)
 -0.26     0       8.0    377  395  3720.19 3759.27     5     400     8   within bracket
                                                                         uH = 13.04, d/s = -1.9, h = 1.00

184)  2vsv + 6q = 11gr + 4di + wo + 9H2O    (Hochella et al., 1980)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss   calc   2sd        summary
     0     0       1.0    375  390   462.97  464.92           377     4   2 (462.10 <-> 464.51)
     0     0       2.0    400  415   460.79  463.64           413     6   cH = 463.31 (sd  0.82)
                                                                         within bracket
                                                                         uH = 0.87, d/s = 0.4, h = 1.00
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Na_2O–Al_2O_3–SiO_2

185) jd + q = abh (Holland, 1980)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	16.5 16.0	600	13.21	14.04		16.11	0.33	3 (13.18 <-> 15.01)
0	-	22.0 21.0	800	13.24	14.87		21.61	0.34	cH = 13.87 (sd 0.28)
0	-	25.0 23.5	900	12.84	15.26		24.36	0.34	within bracket
0	-	27.5 26.0	1000	13.22	15.61		27.09	0.34	uH = 0.77, d/s = 0.3, h = 0.40
0	-	30.0 29.0	1100	13.58	15.15		29.82	0.35	
0	-	33.0 31.0	1200	13.13	16.24		32.52	0.35	

186) jd + q = ab (Newton & Smith, 1967; Holland, 1980)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	15.2 13.5	500	2.67	5.42		14.31	0.35	3 (3.52 <-> 5.32)
0	-	15.7 14.9	550	3.77	5.07		15.49	0.35	cH = 4.11 (sd 0.28) 2
0	-	16.9 16.2	600	3.77	4.90		16.69	0.35	within bracket
0	-	22.0 21.0	800	3.59	5.20		21.68	0.36	uH = 0.76, d/s = 0.7, h = 0.14
0	-	25.0 23.5	900	3.08	5.50		24.36	0.36	
0	-	27.5 26.0	1000	3.46	5.85		27.09	0.37	
0	-	30.0 29.0	1100	3.81	5.39		29.81	0.37	
0	-	33.0 31.0	1200	3.36	6.47		32.51	0.37	

187) jd + ky = abh + cor (Essene et al., 1972)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	19.5 18.5	800	19.18	21.24		18.65	0.28	2 (19.77 <-> 22.11)
0	-	29.3 28.3	1200	20.64	22.61		29.15	0.29	cH = 20.93 (sd 0.28) 2
									within bracket
									uH = 1.00, d/s = 0.3, h = 0.02

188) 2jd = ne + abh (Gasparik, 1985; Robertson et al., 1957; Boettcher & Wyllie, 1968)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	11.0 10.0	600	32.87	36.30		10.14	0.54	3 (34.04 <-> 37.32)
0	-	15.0 14.0	800	35.16	38.55		14.81	0.55	cH = 35.81 (sd 0.92)
0	-	18.3 15.4	825	26.02	35.77	-0.01	15.39	0.55	within bracket
0	-	19.5 18.0	950	31.72	36.75		18.28	0.55	uH = 1.37, d/s = 0.0, h = 0.97
0	-	21.0	1050	34.40			1069	24	
0	-	20.0	1100		41.55		1025	24	
0	-	24.0 23.0	1200	35.76	39.08		23.99	0.56	

189) pa = jd + ky + H2O (Holland, 1979)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	24.0 26.0	550	81.73	83.83		25.74	0.56	3 (83.07 <-> 84.33)
0	0	24.0 25.5	600	82.65	84.23		24.86	0.56	cH = 83.56 (sd 0.29)
0	0	24.0 25.0	650	83.54	84.59		24.02	0.56	within bracket
0	0	23.0 24.5	700	83.35	84.92		23.21	0.56	uH = 0.53, d/s = 0.3, h = 0.51

190) pa = abh + cor + H2O (Chatterjee, 1970)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	1.0	530 550	104.93	106.84	-5	525	4	3 (104.95 <-> 106.11)
0	0	2.0	555 575	104.73	106.49	-3	552	4	cH = 104.49 (sd 0.20)
0	0	3.0	580 600	104.88	106.56	-5	575	4	too low
0	0	5.0	625 640	105.16	106.37	-8	617	6	uH = 0.43, d/s = 0.5, h = 0.36
0	0	6.0	620 650	103.25	105.61		636	6	
0	0	7.0	650 670	104.17	105.72		654	6	

191) pa + q = abh + and + H2O (Chatterjee, 1972)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	1.0	470	490	98.90	100.74	11	501	4	3 (100.25 <-> 101.31)
0	0	2.0	510	530	100.02	101.76		530	4	cH = 101.79 (sd 0.20)
0	0	3.0	540	560	100.41	102.08		557	4	too high
0	0	4.0	560	580	100.07	101.70	1	581	4	uH = 0.45, d/s = 0.1, h = 0.36
0	0	5.0	590	600	100.61	101.41	5	605	6	

192) pa + q = abh + ky + H2O (Chatterjee, 1972)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	5.0	570	625	94.95	98.82		605	6	1 (96.53 <-> 97.69)
0	0	6.0	600	630	96.02	98.10		620	6	cH = 97.43 (sd 0.20)
0	0	7.0	620	640	96.43	97.79		635	6	within bracket
										uH = 0.36, d/s = 1.9, h = 0.15

193) jd + H2O = anl (Manghnani, 1970)

ln_K	x(CO2)	P(kbar)		T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	11.0	6.4	350	-48.73	-40.16		6.46	0.38	1 (-41.38 <-> -40.28)
0	0	9.0	7.5	450	-42.29	-39.60		7.87	0.38	cH = -40.26 (sd 0.34) 2
0	0	9.5	8.0	500	-41.95	-39.30		8.55	0.39	too high but OK
0	0	10.0	8.0	550	-41.50	-38.02		9.30	0.39	uH = 0.32, d/s = 2.1, h = 0.06
0	0	11.0	9.0	575	-42.54	-39.05		9.70	0.39	

194) anl + q = abh + H2O (Thompson, 1971; Liou, 1971)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	2.0	180	200	53.81	54.39		191	4	3 (53.93 <-> 54.30)
0	0	4.0	160	180	53.50	53.99	4	184	4	cH = 54.13 (sd 0.21) 2
0	0	3.0	190	205	54.15	54.57	-1	189	4	within bracket
0	0	4.0	175	195	53.86	54.39		185	4	uH = 0.13, d/s = -0.6, h = 0.98
0	0	5.0	175	190	54.02	54.40		179	4	

K_2O–Al_2O_3–SiO_2

195) mic = san (Carpenter et al., 1994)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	-	0.0	445	460	10.05	10.26		452	16	1 (10.06 <-> 10.25)
										cH = 10.16 (sd 0.11)
										within bracket
										uH = 0.07, d/s = 1.5, h = 1.00

196) mu = san + cor + H2O (Chatterjee & Johannes, 1974)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	1.0	600	630	102.69	105.23	-5	595	4	3 (102.42 <-> 103.32)
0	0	2.0	640	660	102.83	104.34	-8	632	4	cH = 102.22 (sd 0.17)
0	0	4.0	690	710	102.21	103.59		690	6	too low but OK
0	0	6.0	740	750	102.18	102.83		741	6	uH = 0.38, d/s = 0.0, h = 0.34
0	0	8.0	780	800	101.74	102.98		788	6	

197) mu + q = san + and + H2O (Chatterjee & Johannes, 1974)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	0.5	520	560	97.73	101.54		539	4	3 (98.47 <-> 99.36)
0	0	1.0	550	570	97.96	99.61		569	4	cH = 99.52 (sd 0.17)
0	0	2.0	590	605	98.17	99.28	3	608	4	too high but OK
0	0	3.0	620	640	97.96	99.37	2	642	4	uH = 0.38, d/s = 0.9, h = 0.42
0	0	4.0	660	670	98.59	99.27	4	674	6	
0	0	5.0	690	705	98.60	99.57		704	6	

198) mu + q = san + sill + H2O (Chatterjee & Johannes, 1974)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	0.5	540	580	102.00	105.90		544	4	3 (101.87 <-> 102.91)
0	0	2.0	595	630	101.33	104.01		609	4	cH = 102.40 (sd 0.17)
0	0	3.0	630	660	101.74	103.92		639	4	within bracket
0	0	5.0	680	705	101.55	103.25		692	6	uH = 0.44, d/s = 0.7, h = 0.24
0	0	6.0	710	720	101.91	102.57		717	6	

K_2O–MgO–Al_2O_3–SiO_2

199) kals + san = 2lc (Scarfe et al., 1965; Lindsley 1966)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	4.0	600 628	27.75	28.87		620	14	3 (28.31 <-> 28.95)
0	-	6.0	675 700	28.43	29.43		678	14	cH = 28.54 (sd 0.27)
0	-	8.0	725 750	28.08	29.08		737	14	within bracket
0	-	25.0 22.0	1200	26.14	29.89		22.84	0.77	uH = 0.23, d/s = 0.9, h = 0.94

200) san + fo = lc + en (Luth, 1967)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	1.0	975 1005	16.84	17.53		1001	22	1 (16.91 <-> 17.46)
									cH = 17.45 (sd 0.25)
									within bracket
									uH = 0.12, d/s = 3.0, h = 0.64

201) 2phl + 3en = 2san + 6fo + 2H2O (Luth, 1967)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	0.4	850 900	260.69	270.26		873	14	1 (261.86 <-> 268.37)
0	0	0.7	905 950	261.11	269.13		927	16	cH = 265.12 (sd 1.38)
									within bracket
									uH = 0.97, d/s = 4.2, h = 0.23

202) 2phl + san = 3lc + 3fo + 2H2O (Luth, 1967)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	0.4	900 950	315.99	328.96		906	10	1 (316.28 <-> 320.30)
0	0	0.7	940 960	315.64	320.58		947	12	cH = 317.47 (sd 1.43)
									within bracket
									uH = 1.33, d/s = 1.7, h = 0.41

* 2phl = kals + lc + 3fo + 2H2O (Luth, 1967)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	0.4	1000 1020	289.85	294.02	-4	996	14	** NOT USED **
0	0	0.7	1050 1075	288.74	293.68		1051	14	cH = 288.93 (sd 1.44)
0	0	1.0	1150 1175	300.60	305.36	-61	1089	16	

203) kals + 2en = san + 2fo (Wendlandt & Eggler, 1980)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	27.0 25.0	1170	-8.13	-6.32		25.05	1.15	1 (-7.99 <-> -6.46)
									cH = -6.36 (sd 0.52)
									too high but OK
									uH = 0.47, d/s = 1.9, h = 0.36

* 5mu + 3clin = 5phl + 8ky + q + 12H2O (Bird & Fawcett, 1973)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-1.00	0	7.2	632 640	1062.65	1067.95	-11	621	12	** NOT USED **
-1.00	0	8.3	634 646	1060.44	1068.21	-8	626	12	cH = 1055.37 (sd 3.74)

* 5mu + 3clin = 5phl + 8ky + q + 12H2O (Massonne, unpub)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-1.68	0	4.0	540 570	1018.19	1040.11	21	591	10	** NOT USED **
-1.68	0	6.0	570 590	1030.12	1043.94	17	607	10	cH = 1055.37 (sd 3.74)

* 6mu + 2phl + 15q = 3crd + 8san + 8H2O (Seifert, 1976)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
1.46	0	1.0	520 530	846.34	853.58	12	542	6	** NOT USED **
1.46	0	2.0	580 600	860.26	873.63		583	6	cH = 862.22 (sd 2.10)
1.46	0	3.0	630 640	868.31	874.64	-10	620	6	
1.46	0	4.0	660 670	864.52	870.62	-4	656	6	
1.46	0	5.0	685 700	858.63	867.51		691	6	

* mu + clin + 2q = crd + phl + 4H2O (Seifert, 1970)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-0.29	0	1.0	485 505	378.96	385.75		504	4	** NOT USED **
-0.29	0	2.0	515 535	380.47	386.81		531	6	cH = 385.43 (sd 0.85)
-0.29	0	5.0	595 625	385.50	394.13		595	6	
-0.29	0	6.0	625 645	388.63	394.25	-11	614	6	
-0.29	0	7.0	650 660	390.45	393.20	-18	632	6	

204) 6cel + 6ky + 2H2O = 2ta + 6mu + 4coe (Massonne & Schreyer, 1989)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-2.11	0	41.0 39.0	750	-224.93	-215.52	-0.89	38.11	1.87	5 (-223.36 <-> -213.80)
-2.54	0	41.0 39.0	670	-227.53	-218.02	-1.40	37.60	1.84	cH = -211.31 (sd 4.43) 3
0.42	0	36.0 34.0	770	-221.73	-212.14	-0.17	33.83	1.84	too high but OK
-1.25	0	36.0 34.0	666	-213.94	-204.22		35.46	1.82	uH = 3.67, d/s = -1.8, h = 0.58
1.22	0	36.0 34.0	587	-236.77	-226.94	-3.15	30.85	1.77	
2.41	0	31.0 29.0	754	-215.41	-205.61		30.16	1.81	
4.00	0	31.0 29.0	685	-230.15	-220.25	-1.79	27.21	1.77	
1.63	0	31.0 29.0	601	-214.40	-204.39		30.38	1.77	

205) 6cel + 6ky + 2H2O = 2ta + 6mu + 4q (Massonne & Schreyer, 1989)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
3.11	0	26.0 24.0	742	-216.30	-204.67	2.86	28.86	1.58	4 (-226.73 <-> -218.36)
5.46	0	26.0 24.0	656	-236.61	-224.87		25.35	1.54	cH = -232.78 (sd 4.43) 3
3.49	0	26.0 24.0	573	-223.30	-211.45	1.61	27.61	1.54	too low but OK
8.66	0	21.0 19.0	728	-233.63	-221.81		20.86	1.54	uH = 2.52, d/s = -3.9, h = 0.42
6.63	0	21.0 19.0	647	-216.10	-204.16	2.81	23.81	1.53	
14.52	0	16.0 14.0	663	-247.76	-235.74	-0.49	13.51	1.52	

* 3cel = phl + 2san + 3q + 2H2O (Massonne & Schreyer, 1987)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
1.94	0	21.0 19.0	645	150.54	159.65	-1.80	17.20	1.05	** NOT USED **
3.60	0	16.0 14.0	649	161.59	171.13		14.66	1.02	cH = 167.96 (sd 2.38)
4.92	0	11.6 9.6	590	164.03	174.01		10.81	0.98	
5.73	0	11.6 9.6	590	158.25	168.23		9.65	0.96	
5.29	0	11.6 9.6	689	175.57	185.81	1.53	13.13	1.00	
8.28	0	8.0 6.0	650	165.65	176.69		7.57	0.91	
10.83	0	6.0 4.0	700	162.46	174.87		5.09	0.81	

* 3cel = phl + 2san + 3q + 2H2O (Velde, 1965; Massonne & Schreyer, 1987)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
7.67	0	2.0	375 390	165.66	167.64	3	393	28	** NOT USED **
5.68	0	4.5	440 480	172.40	178.79	-28	412	26	cH = 167.96 (sd 2.38)

206) 3mu + 2phl = 3east + 2san + 3q + 2H2O (Massonne & Schreyer, 1987)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-2.10	0	6.0 4.0	700	192.91	203.77		4.97	4.04	1 (193.78 <-> 202.90)
									cH = 198.34 (sd 10.40) 2
									within bracket
									uH = 1.16, d/s = 4.7, h = 1.00

```
*  ta + mu = phl + ky + 3q + H2O   (Massonne & Schreyer, 1989)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc   2sd        summary
  0.06     0     10.0     595  623     91.18   92.95     17     640    24     ** NOT USED **
  0.28     0     15.0     662  675     91.18   91.92     37     712    26    cH = 94.02 (sd  0.72)
  0.49     0     20.0     723  732     90.69   91.16     55     787    30
  0.70     0     25.0     771  790     89.25   90.16     81     871    32

207)  3clin + 3phl + 23q = 3mu + 8ta + 4H2O    (Massonne & Schreyer, 1989)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc   2sd        summary
 -1.63     0      9.6     562        297.89                     601    46    2 (304.51 <-> 309.22)
 -1.63     0     14.0          544          308.49              505    44    cH = 303.23 (sd  2.91) 3
 -0.91     0     10.6     639        305.24            -17      622    50    too low but OK
 -0.91     0     13.0          619          309.72              566    48    uH = 1.69, d/s = 1.0, h = 0.13


208)  2phl + 6q = 3en + 2san + 2H2O   (Bohlen et al., 1983)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc   2sd        summary
     0  0.66      5.0     775  805   213.31  217.58     17     822    20    1 (213.77 <-> 217.12)
                                                                           cH = 219.95 (sd  1.37) 2
                                                                           too high
                                                                           uH = 0.74, d/s = 2.9, h = 0.13

209)  2phl + 6q = 3en + 2san + 2H2O   (Peterson & Newton, 1990)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc   2sd        summary
     0  0.73      2.5     745  765   218.51  221.69             754    18    1 (218.76 <-> 221.43)
                                                                           cH = 219.95 (sd  1.37) 2
                                                                           within bracket
                                                                           uH = 0.82, d/s = 1.9, h = 0.20

*  2phl + 6q = 3en + 2san + 2H2O   (Wood, 1976)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss    calc   2sd        summary
     0     0   0.3  0.3      750     222.88  225.11   0.08    0.43  0.08     ** NOT USED **
     0     0   0.5  0.4      790     225.83  228.19   0.25    0.72  0.15    cH = 219.95 (sd  1.37)
```

Na_2O–MgO–Al_2O_3–SiO_2 & K_2O–CaO–MgO–Al_2O_3–SiO_2

210) 2jd + ta = gl (Carman & Gilbert, 1985)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	-	37.0 35.0	800		-17.54	-16.09		35.82	2.18	1 (-17.52 <-> -16.12)
										cH = -16.69 (sd 0.79)
										within bracket
										uH = 0.52, d/s = 1.4, h = 0.98

211) 2naph + 3en = 2abh + 6fo + 2H2O (Carman & Gilbert, 1985)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	0.8	820	852	251.59	257.45	-5	815	14	2 (249.33 <-> 251.92)
0	0	1.6	850	870	246.36	249.67	6	876	16	cH = 250.63 (sd 1.37)
										within bracket
										uH = 0.93, d/s = -1.0, h = 1.00

212) 5phl + 6cc + 24q = 3tr + 5san + 6CO2 + 2H2O (Hewitt, 1975)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0.72	6.0	610		600.39			619	14	2 (602.89 <-> 611.41)
0	0.68	6.0		630		611.30		618	14	cH = 605.21 (sd 3.83) 2
0	0.58	6.0	610		603.00			614	14	within bracket
0	0.55	6.0		625		611.84		612	14	uH = 3.05, d/s = 1.4, h = 0.16

* 3dol + san + H2O = phl + 3cc + 3CO2 (Puhan & Johannes, 1974; Puhan, 1978)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
-0.12	0.83	2.0	490		161.62		-18	472	14	** NOT USED **
-0.12	0.75	2.0		490		165.45		455	12	cH = 157.81 (sd 1.39)
-0.12	0.60	2.0	460		164.23		-28	432	12	
-0.12	0.47	2.0		470		170.46		417	12	
-0.19	0.80	4.0	550		158.90		-6	544	14	
-0.19	0.86	4.0		580		160.95		563	14	
-0.19	0.64	6.0	575		157.92		-1	574	14	
-0.22	0.59	6.0		575		159.96		564	14	

213) mu + cc + 2q = san + an + CO2 + H2O (Hewitt, 1973)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0.50	2.0	450	500	179.80	189.60		450	4	3 (181.18 <-> 183.61)
0	0.50	4.0	525	540	182.06	184.82	-13	512	4	cH = 179.72 (sd 0.39) 2
0	0.50	5.0	550	560	181.38	183.18	-9	541	4	too low
0	0.50	6.0	575	585	180.99	182.76	-7	568	4	uH = 1.03, d/s = 0.3, h = 0.08
0	0.50	7.0	605	615	181.69	183.42	-11	594	4	

* 2zo + mu + 2q = 4an + san + 2H2O (Johannes, 1980)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	4.0	470	490	213.02	217.83	11	501	4	** NOT USED **
0	0	4.8	510	520	215.22	217.60	12	532	4	cH = 220.57 (sd 0.43)
0	0	5.5	530	555	213.57	219.48	5	560	4	
0	0	6.0	555	570	214.93	218.46	9	579	4	
0	0	7.0	595	610	215.29	218.78	8	618	4	
0	0	8.8 8.0	660		214.33	221.38		8.09	0.10	

Na_2O–CaO–Al_2O_3–SiO_2 & Na_2O–CaO–MgO–Al_2O_3–SiO_2

* 4law + ab = 2zo + pa + 2q + 6H2O (Heinrich & Althaus, 1980)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	7.0	360	400	400.86	411.85	-18	342	4	** NOT USED **
0	0	9.5	405	445	401.08	413.48	-22	383	4	cH = 395.25 (sd 0.95)
0	0	12.0	435	465	398.94	408.05	-12	423	6	

* 4law + jd = 2zo + pa + q + 6H2O (Heinrich & Althaus, 1980)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	12.0	435	465	404.34	414.59	-15	420	6	** NOT USED **
0	0	15.0	460	480	395.37	401.98		472	6	cH = 399.36 (sd 0.97)

214) 2parg + 5en = 2di + 8fo + 2an + 2abh + 2H2O (Lykins & Jenkins, 1992)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
-2.09	0	0.5	760	790	303.89	310.98		787	14	3 (308.21 <-> 312.43)
-2.09	0	1.0	828	860	307.02	313.91		843	16	cH = 310.32 (sd 1.66)
-2.09	0	1.5	880	900	309.61	313.66		884	16	within bracket
										uH = 1.66, d/s = 0.4, h = 1.00

FeO–SiO_2

215) fs = fa + q (Bohlen et al., 1980)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	10.7 10.3	700	-0.46	-0.35		10.32	0.28	3 (-0.44 <-> -0.27)
0	-	11.2 10.8	750	-0.44	-0.32		10.92	0.29	cH = -0.35 (sd 0.03)
0	-	11.7 11.3	800	-0.41	-0.29		11.52	0.30	within bracket
0	-	12.2 11.8	850	-0.37	-0.25		12.14	0.30	uH = 0.07, d/s = 0.2, h = 0.99
0	-	12.9 12.4	900	-0.39	-0.23		12.79	0.31	
0	-	13.5 13.1	950	-0.37	-0.25		13.44	0.32	
0	-	14.3 13.9	1000	-0.43	-0.30		14.06	0.33	
0	-	15.0 14.6	1050	-0.46	-0.34		14.65	0.34	

216) 4mt + O2 = 6hem (Myers & Eugster, 1983)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
10.82	-	0.0	1053 1043	-490.23	-483.67	5	1058	6	3 (-490.87 <-> -486.05)
9.59	-	0.0	1083 1073	-487.71	-481.21	12	1095	6	cH = -492.19 (sd 1.19) 2
8.77	-	0.0	1113 1103	-489.21	-482.71	8	1121	6	too low but OK
8.06	-	0.0	1142 1132	-491.22	-484.73	3	1145	6	uH = 1.72, d/s = -0.5, h = 0.32
7.21	-	0.0	1172 1162	-491.69	-485.21	1	1173	6	
6.48	-	0.0	1201 1191	-492.68	-486.22		1200	8	
5.74	-	0.0	1228 1218	-492.72	-486.25		1226	8	
5.08	-	0.0	1262 1252	-495.64	-489.14		1251	8	
4.79	-	0.0	1274 1264	-495.81	-489.30		1263	8	

217) 4mt + O2 = 6hem (Chou, 1978)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
36.15	-	2.0	605 595	-505.21	-495.03	-11	584	4	3 (-498.42 <-> -491.61)
31.64	-	2.0	655 645	-500.91	-491.01		640	4	cH = -492.19 (sd 1.19)
27.38	-	2.0	705 695	-494.12	-488.59		701	4	within bracket
24.96	-	2.0	755 745	-499.22	-489.62		741	4	uH = 2.82, d/s = -0.2, h = 0.36
22.29	-	2.0	805 795	-500.06	-490.43		788	6	

218) 3fa + O2 = 3q + 2mt (Chou, 1978)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
45.08	-	2.0	605 595	-528.65	-519.25	1	606	4	3 (-528.78 <-> -521.82)
41.65	-	2.0	655 645	-529.09	-519.80		655	4	cH = -529.08 (sd 0.95) 2
38.59	-	2.0	705 695	-529.60	-520.34		704	4	too low but OK
36.01	-	2.0	755 745	-531.69	-522.41		749	4	uH = 2.49, d/s = 1.3, h = 0.06
33.41	-	2.0	805 795	-531.38	-522.09		800	4	

219) 3fa + O2 = 3q + 2mt (Myers & Eugster, 1983)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
41.85	-	0.0	666 656	-532.05	-520.90		660	4	1 (-528.55 <-> -521.52)
38.55	-	0.0	716 706	-530.37	-519.20		713	4	cH = -529.08 (sd 0.95) 2
38.09	-	0.0	721 711	-529.05	-517.84		721	4	too low but OK
36.63	-	0.0	750 740	-530.44	-519.22		747	4	uH = 2.33, d/s = 1.7, h = 0.06
35.77	-	0.0	770 760	-532.32	-521.03		763	4	
21.81	-	0.0	1123 1113	-531.77	-519.33		1115	6	
21.33	-	0.0	1138 1128	-531.21	-518.74		1132	6	

220) 3fa + O2 = 3q + 2mt (Hewitt, 1978)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
42.64	-	1.0	657 647	-535.68	-526.80		644	4	1 (-532.81 <-> -526.95)
39.08	-	1.0	709 699	-533.42	-525.98		700	4	cH = -529.08 (sd 0.95)
36.26	-	1.0	757 747	-532.69	-527.07		749	4	within bracket
31.25	-	2.0	857 847	-533.84	-526.20		846	4	uH = 2.31, d/s = 1.2, h = 0.25

221) 3fa + O2 = 3q + 2mt (O'Neill, 1987)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
37.98	-	0.0	732	722	-533.37	-526.61		723	4	3 (-531.99 <-> -526.76)
32.77	-	0.0	832	822	-533.17	-526.66		823	4	cH = -529.08 (sd 0.95)
28.43	-	0.0	932	922	-532.94	-526.59		922	4	within bracket
24.74	-	0.0	1032	1022	-532.51	-526.26		1023	6	uH = 1.92, d/s = 1.4, h = 0.42
21.56	-	0.0	1132	1122	-531.88	-525.69		1124	6	

222) q + 2iron + O2 = fa (O'Neill, 1987)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
50.76	-	0.0	732	722	-570.72	-563.05		726	2	1 (-569.60 <-> -563.36)
44.56	-	0.0	832	822	-570.58	-563.22		826	2	cH = -567.34 (sd 0.68)
39.38	-	0.0	932	922	-570.28	-563.22		926	2	within bracket
35.00	-	0.0	1032	1022	-569.95	-563.02		1026	4	uH = 2.29, d/s = 1.4, h = 0.16
31.26	-	0.0	1132	1122	-569.74	-562.92		1126	4	

223) 3iron + 2O2 = mt (O'Neill, 1988)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
138.74	-	0.0	482	472	-1123.92	-1106.36		476	2	1 (-1123.82 <-> -1107.05)
127.80	-	0.0	532	522	-1123.75	-1106.90		526	2	cH = -1115.55 (sd 0.98)
121.32	-	0.0	565	555	-1123.62	-1107.24		559	2	within bracket
										uH = 6.54, d/s = 1.3, h = 0.03

224) 2gth = hem + H2O (Voigt & Will, 1981)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	10.0	180	200	55.63	56.45		184	4	3 (55.46 <-> 56.07)
0	0	20.0	250	280	55.00	56.23		269	4	cH = 55.77 (sd 0.22)
0	0	30.0	300	350	54.55	56.53		331	6	within bracket
0	0	40.0	350	400	54.74	56.43		379	10	uH = 0.22, d/s = 0.7, h = 1.00
0	0	50.0	400	420	55.20	55.95		415	12	

225) sid + hem = mt + CO2 (Koziol, pers com 1994)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	1	6.0	510	520	77.25	78.30		519	6	3 (77.45 <-> 78.94)
0	1	8.0	550	570	77.10	79.23		560	6	cH = 78.17 (sd 0.36)
0	1	9.0	570	590	77.23	79.41		579	6	within bracket
0	1	10.0	590	600	77.51	78.60		596	6	uH = 0.63, d/s = 0.1, h = 0.90
0	1	11.0	600	620	76.78	78.92		613	6	
0	1	12.0	630	640	78.23	79.29	-1	629	6	

226) 2grun = 7fs + 2q + 2H2O (Lattard & Evans, 1992)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	16.0	599		200.11			604	20	6 (199.59 <-> 201.42)
0	0	12.0		637		200.57	1	638	18	cH = 200.69 (sd 1.06)
0	0	14.0	620		200.45			622	20	within bracket
0	0	20.0	563	588	200.58	203.21		564	22	uH = 0.66, d/s = -0.0, h = 0.70

227) 2grun = 7fa + 9q + 2H2O (Lattard & Evans, 1992)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	2.0	549	573	196.51	200.76		559	12	1 (196.94 <-> 200.33)
										cH = 198.22 (sd 1.07)
										within bracket
										uH = 0.89, d/s = 2.4, h = 0.31

228) 2deer = 9fs + 6mt + 6q + $10H_2O$ (Lattard & Le Breton, 1994)

ln_K	x(CO_2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	20.0	600	626	609.47	621.94		625	16	2 (616.47 <-> 626.43)
0	0	27.0	710	740	620.96	634.50		711	18	cH = 621.42 (sd 3.62)
										within bracket
										uH = 3.57, d/s = 0.1, h = 0.65

229) deer + Ni = 6fs + 2mt + NiO + $5H_2O$ (Lattard & Le Breton, 1994)

ln_K	x(CO_2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	21.5	570		328.60			604	18	2 (334.32 <-> 338.31)
0	0	20.0		600		338.33		591	16	cH = 336.34 (sd 1.84)
0	0	27.0	640	670	334.29	340.83		649	18	within bracket
										uH = 1.43, d/s = 1.4, h = 0.37

FeO–Al_2O_3–SiO_2

230) alm + 3hem = 3mt + ky + 2q   (Harlov & Newton, 1992)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	23.0 20.0	650	-23.89	-18.71		21.14	0.66	3 (-21.79 <-> -19.75)
0	-	22.5 22.0	700	-20.43	-19.57	0.15	22.65	0.66	cH = -20.69 (sd 0.54)
0	-	26.0 25.5	800	-21.59	-20.73	-0.02	25.48	0.66	within bracket
0	-	29.0 28.0	900	-21.85	-20.12		28.33	0.66	uH = 0.86, d/s = -0.2, h = 0.84

231) alm + 2sill = 3herc + 5q   (Bohlen et al., 1986)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	3.0	800		6.65		708	24	5 (2.49 <-> 3.98)
0	-	2.9	780		6.19		701	26	cH = 3.48 (sd 0.42) 2
0	-	5.2	865 880	3.61	4.17	-4	861	22	within bracket
0	-	5.5 5.1	880	3.44	4.41		5.48	0.43	uH = 0.39, d/s = -2.8, h = 0.82
0	-	6.9 6.5	940	2.31	3.27	-0.09	6.41	0.43	
0	-	8.9 8.5	1020	0.63	1.59	-0.79	7.71	0.43	
0	-	8.8	1015 1035	0.67	1.47	50	1085	20	

232) alm + 5cor = 3herc + 3sill   (Shulters & Bohlen, 1989)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	7.2	850	6.73		-58	792	24	6 (4.75 <-> 6.10)
0	-	8.3 7.9	900	5.80	6.91	0.51	8.81	0.34	cH = 4.38 (sd 0.46) 2
0	-	10.6 9.9	1000	3.96	5.88		10.45	0.34	too low but OK
0	-	12.3 11.9	1100	4.15	5.24		12.21	0.35	uH = 0.57, d/s = -1.3, h = 0.24

233) 2alm + 4sill + 5q = 3fcrd   (Mukhopadhyay et al., 1991)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	2.3 1.9	650	110.62	115.18	-0.05	1.85	0.14	3 (114.71 <-> 116.75)
0	-	2.5 2.1	700	113.45	117.99		2.30	0.14	cH = 115.71 (sd 1.13)
0	-	2.7 2.3	750	116.30	120.83	0.05	2.75	0.14	within bracket
									uH = 0.73, d/s = -0.8, h = 0.94

234) 6fst + 25q = 8alm + 46ky + 12H2O   (Rao & Johannes, 1979)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	6.0	680 700	998.55	1010.01		683	18	3 (999.59 <-> 1007.87)
0	0	10.0	640 660	993.15	1003.57		654	20	cH = 1000.50 (sd 5.16) 2
0	0	15.0	590 610	1001.23	1010.53	-2	588	24	within bracket
									uH = 3.01, d/s = 0.4, h = 0.75

* 6fst + 25q = 8alm + 46ky + 12H2O   (Ganguly, 1972)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	7.0	700	1012.49		-21	679	18	** NOT USED **
0	0	10.0	690		1019.16		654	20	cH = 1000.50 (sd 5.16)
0	0	10.6 14.0	650	1001.66	1022.48	-0.21	10.39	2.40	
0	0	15.5	600 650	1009.52	1032.50	-20	580	24	

* 2fst + 15q = 4fcrd + 10sill + 4H2O   (Richardson, 1968)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	2.0	550 575	578.35	592.31	12	587	8	** NOT USED **
0	0	4.0	675	596.84			679	8	cH = 598.77 (sd 2.42)
0	0	3.0	650		607.86		633	8	

235) 23fctd + 7q = 2fst + 5alm + 19H2O   (Rao & Johannes, 1979)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
1.18	0	10.0	560 580	1750.60	1775.69		573	10	2 (1759.19 <-> 1779.14)
1.18	0	14.0	580	1766.25			580	10	cH = 1766.80 (sd 5.92) 2
1.18	0	6.0	560		1772.09		556	10	within bracket
									uH = 7.14, d/s = 0.4, h = 0.06

236) 8fctd + 10ky = 2fst + 3q + 4H_2O (Rao & Johannes, 1979)

ln_K	x(CO_2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0.41	0	6.0	530 550	404.48	411.12	-22	508	14	3 (399.29 <-> 404.98)
0.41	0	10.0	550 570	398.84	405.31	-6	544	14	cH = 397.04 (sd 2.38) 2
0.41	0	14.0	570 590	396.09	402.50		573	16	too low but OK
									uH = 2.04, d/s = -0.5, h = 0.38

237) 3fctd = alm + 2cor + 3H_2O (Ganguly, 1969; Vidal et al., 1994)

ln_K	x(CO_2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-0.49	0	12.0	570 595	281.44	286.62	7	602	8	3 (285.83 <-> 288.42)
-0.49	0	19.0	612 640	285.78	291.29		624	8	cH = 288.07 (sd 0.79) 2
-0.49	0	25.0	627 635	287.04	288.58		632	8	within bracket
-0.49	0	30.0	615 650	284.34	290.95		635	10	uH = 1.10, d/s = -0.2, h = 0.16

238) 3fctd = alm + 2cor + 3H_2O (Ganguly, 1969)

ln_K	x(CO_2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	8.0	580 600	284.34	288.56		598	8	3 (286.21 <-> 289.04)
0	0	11.5	605 620	285.58	288.63		617	8	cH = 288.07 (sd 0.79) 2
0	0	15.0	620 640	285.84	289.78		631	8	within bracket
0	0	20.0	650 670	289.10	292.93	-5	645	8	uH = 1.02, d/s = -0.3, h = 0.19

239) 3fctd = 4dsp + alm + H_2O (Vidal et al., 1994)

ln_K	x(CO_2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-0.16	0	30.0	615 635	122.80	124.03	7	642	28	2 (122.82 <-> 124.28)
-0.16	0	33.0	580 615	123.06	125.19		603	30	cH = 124.46 (sd 0.81) 2
									too high but OK
									uH = 0.61, d/s = 0.8, h = 0.40

* 6fst + 25q = 8alm + 46sill + 12H_2O (Richardson, 1968)

ln_K	x(CO_2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	2.0	680		1481.77		560	10	** NOT USED **
0	0	5.0	675 700	1389.57	1417.82	-49	626	10	cH = 1333.44 (sd 5.68)

240) 6fst + 25q = 8alm + 46sill + 12H_2O (Dutrow & Holdaway, 1989)

ln_K	x(CO_2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
7.22	0	3.2	627 647	1324.72	1347.16		635	10	2 (1330.48 <-> 1347.16)
7.22	0	5.0	673 693	1330.48	1351.94		676	10	cH = 1333.44 (sd 5.68) 2
									within bracket
									uH = 5.97, d/s = 1.4, h = 0.14

* 8fctd + 10sill = 2fst + 3q + 4H_2O (Richardson, 1968)

ln_K	x(CO_2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0.41	0	2.0	500 550	330.40	342.42	-24	476	20	** NOT USED **
0.41	0	5.0	525 550	338.40	343.80	-63	462	22	cH = 324.66 (sd 2.47)

* 5fctd = fcrd + 3herc + 5H_2O (Grieve & Fawcett, 1974)

ln_K	x(CO_2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	1.0	525 550	529.32	541.94	-13	512	6	** NOT USED **
0	0	2.0	550 575	526.71	538.51	-8	542	6	cH = 522.77 (sd 1.44)

Na_2O–FeO–Al_2O_3–SiO_2 & K_2O–FeO–Al_2O_3–SiO_2

241) 2fgl = 4abh + 3fa + q + 2H2O (Hoffmann, 1972)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	3.0	340	370	247.91	257.62		351	28	2 (243.13 <-> 247.91)
0	0	5.0	350	370	236.77	243.14	27	397	30	cH = 251.49 (sd 5.22) 3
										too high but OK
										uH = 1.71, d/s = -1.4, h = 0.47

242) rieb + 3hem = 2acm + 3mt + 4q + H2O (Ernst, 1962)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
0	0	0.5	465	490	104.46	108.10		485	8	3 (106.57 <-> 108.18)
0	0	1.0	489	499	106.48	107.86		495	8	cH = 107.38 (sd 0.56)
0	0	2.0	511	516	107.71	108.38	-2	509	8	within bracket
										uH = 0.68, d/s = 0.1, h = 1.00

* 2ann + 6sill + 9q = 3fcrd + 2san + 2H2O (Holdaway & Lee, 1977)

ln_K	x(CO2)	P(kbar)		T(C)	H(low)	H(high)	miss	calc	2sd	summary
1.60	0	2.1	1.9	640	270.85	273.32	-0.30	1.60	0.29	** NOT USED **
1.60	0	2.8	2.6	710	276.20	278.60		2.72	0.31	cH = 277.19 (sd 2.70)

$CaO–FeO–Al_2O_3–SiO_2$

* gr + 2alm = 3fa + 3an (Bohlen et al., 1983)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
5.32	-	5.1 4.7	750	34.98	38.38		4.95	0.38	** NOT USED **
5.32	-	5.2 4.8	800	37.99	41.39	0.20	5.40	0.38	cH = 36.25 (sd 1.62)
5.32	-	5.6 5.2	850	38.46	41.86	0.26	5.86	0.39	
5.32	-	6.0 5.6	900	38.95	42.34	0.32	6.32	0.39	
5.32	-	6.4 6.0	950	39.44	42.83	0.38	6.78	0.39	
5.32	-	6.8 6.4	1000	39.96	43.34	0.44	7.24	0.39	
5.32	-	7.1 6.7	1050	41.35	44.73	0.60	7.70	0.39	

* gr + 2alm = 3fa + 3an (Perkins & Vielzeuf, 1992)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
5.32	-	6.4 6.0	900	35.56	38.95		6.32	0.39	** NOT USED **
5.32	-	6.8 6.3	950	36.06	40.29		6.78	0.39	cH = 36.25 (sd 1.62)
5.32	-	7.1 6.6	1000	37.43	41.65	0.14	7.24	0.39	
5.32	-	7.3 7.0	1050	39.66	42.19	0.40	7.70	0.39	

243) 2hed = 2wo + fa + q (Lindsley & Munoz, 1969)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-2.10	-	1.0	945	28.89	33.14		-2.11	0.26	1 (29.33 <-> 32.69) cH = 31.11 (sd 1.34) 3 within bracket uH = 0.59, d/s = 3.6, h = 0.05

244) 2fact = 3fa + 5q + 4hed + 2H2O (Ernst, 1966)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0	1.0	452 465	167.10	169.16	28	493	16	4 (172.35 <-> 174.89)
0	0	2.0	498 509	172.79	174.45		503	18	cH = 173.61 (sd 1.33) 2
0	0	3.0	528 546	176.26	178.90	-18	510	18	within bracket uH = 0.76, d/s = -4.6, h = 0.98

245) andr = 3pswo + hem (Huckenholz & Yoder, 1971)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	0.0	1130 1150	58.92	59.93		1139	16	1 (59.00 <-> 59.84) cH = 59.35 (sd 0.38) 2 within bracket uH = 0.25, d/s = 2.0, h = 0.16

246) 6andr + 3fa = 6mt + 18wo + 3q (Gustavson, 1974)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	0.5	740 760	203.48	210.61		743	12	3 (203.43 <-> 207.96)
0	-	1.0	760 773	204.04	208.68		761	12	cH = 204.47 (sd 2.13) 2
0	-	2.0	785 797	199.86	204.14	1	798	12	within bracket uH = 1.83, d/s = 0.0, h = 0.42

247) 6andr + 2Ni = 4mt + 18wo + 2NiO (Gustavson, 1974)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	0.5	785 800	253.88	259.09		787	12	3 (252.30 <-> 257.15)
0	-	1.0	795 815	251.37	258.32		805	12	cH = 254.67 (sd 2.13) 2
0	-	2.0	825 840	249.85	255.06		839	12	within bracket uH = 1.77, d/s = 0.3, h = 0.40

248) 6andr = 4mt + 18wo + O2 (Moecher & Chou, 1990)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-29.84	-	2.0	840 860	733.21	739.89		840	6	2 (732.02 <-> 741.08) cH = 733.56 (sd 2.10) 2 within bracket uH = 3.84, d/s = 0.9, h = 0.05

* 3andr + mt + 9q = 9hed + 2O2   (Burton et al., 1982)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-82.83	-	2.0	600	1038.02	1046.04	-2.43	-79.85	1.74	** NOT USED **
-68.58	-	2.0	700	1036.81	1045.76	-2.03	-66.00	1.56	cH = 1020.39 (sd 6.30)
-56.97	-	2.0	800	1035.43	1045.60	-1.68	-54.72	1.41	

* 2andr + q + 3fa = 4hed + 2wo + 2mt   (Liou, 1974)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	0.5	540 560	31.33	33.01	-530	10	254	** NOT USED **
0	-	2.0	595 615	33.78	35.70	-499	96	188	cH = 5.93 (sd 2.77)

* 2andr + 4q + 2Ni = 4hed + 2wo + 2NiO   (Liou, 1974)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	0.5	610 650	73.89	77.37	-199	411	64	** NOT USED **
0	-	2.0	670 690	78.39	80.13	-250	420	64	cH = 56.13 (sd 2.92)

* 3andr + mt + 9q = 9hed + 2O2   (Moecher & Chou, 1990)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-80.87	-	2.0	650	1068.00	1100.51	-6.20	-72.55	1.64	** NOT USED **
-72.99	-	2.0	700	1067.66	1086.29	-5.84	-66.00	1.56	cH = 1020.39 (sd 6.30)

* 2andr + 4q = 4hed + 2wo + O2   (Moecher & Chou, 1990)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-44.60	-	2.0	600	544.83	568.56	-1.35	-41.61	0.79	** NOT USED **
-40.03	-	2.0	650	550.25	556.08	-1.99	-37.67	0.74	cH = 535.01 (sd 2.86)
-36.38	-	2.0	700	546.38	560.17	-1.41	-34.12	0.71	
-28.85	-	2.0	800	537.30	547.57	-0.26	-28.02	0.64	

* 3cc + hem + 3q = andr + 3CO2   (Taylor & Liou, 1978)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	1	2.0	649		240.84		607	6	** NOT USED **
0	0.50	2.0	589 600	241.15	243.65	-38	551	6	cH = 232.36 (sd 0.71)
0	0.22	2.0	550 570	242.94	248.09	-41	509	6	

249) 3q + 2hem + 3gr = 2andr + 3an (Liou, 1973)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
7.29	-	3.0	670	694	80.67	82.53	-13	657	26	1 (80.62 <-> 82.57) cH = 79.66 (sd 1.06) 2 too low but OK uH = 0.78, d/s = 1.2, h = 0.23

250) 3gr + 4hem + 5q + 2H2O = 4fep + an (Liou, 1973)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
1.67	0	3.0	670	694	30.16	31.78		680	60	2 (29.95 <-> 31.99) cH = 30.89 (sd 2.02) 3 within bracket uH = 0.87, d/s = 0.9, h = 0.35

251) 3gr + 4hem + 5q + 2H2O = 4fep + an (Holdaway, 1972)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
1.67	0	3.0	690	710	31.52	32.81	-10	680	60	2 (31.14 <-> 33.19) cH = 30.89 (sd 2.02) 3 too low but OK uH = 0.87, d/s = 0.7, h = 0.39

252) 2fep = andr + an + hem + q + H2O (Holdaway, 1972)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
2.93	0	3.0	690	710	24.38	26.40		692	480	1 (24.59 <-> 26.19) cH = 24.39 (sd 1.07) 3 too low but OK uH = 0.41, d/s = 2.5, h = 0.15

253) 2fep = andr + an + hem + q + H2O (Liou, 1973)

ln_K	x(CO2)	P(kbar)	T(C)		H(low)	H(high)	miss	calc	2sd	summary
2.93	0	3.0	670	694	24.31	26.29		692	480	1 (24.51 <-> 26.08) cH = 24.39 (sd 1.07) 3 too low but OK uH = 0.40, d/s = 2.5, h = 0.16

Osumilite + KFMASH melt equilibria

```
*  osm1 = crd + san + 2q    (Olesch & Seifert, 1981)

  ln_K  x(CO2)  P(kbar)      T(C)     H(low) H(high)  miss   calc   2sd          summary
  0.76     -       0.5     760  780   15.96   16.24    124    904   206      ** NOT USED **
                                                                          cH = 18.17 (sd  2.01) 2
```

```
*  4phl + 3crd + 2san + 33q = 6osm2 + 4H2O    (Olesch & Seifert, 1981)

  ln_K  x(CO2)  P(kbar)      T(C)     H(low) H(high)  miss   calc   2sd          summary
 -5.88     0       0.5     760  780  536.06  544.19    -24    736    74      ** NOT USED **
                                                                          cH = 526.11 (sd  14.38) 2
```

```
254)  en + san + 2sill + 3q = osm1    (Carrington & Harley, 1995)

  ln_K  x(CO2)  P(kbar)      T(C)     H(low) H(high)  miss   calc   2sd          summary
  0.13     -    8.3  7.7     900      -9.86   -7.91          8.00  1.11     1 (-9.76 <-> -8.02)
                                                                          cH = -8.89 (sd  1.98) 2
                                                                          within bracket
                                                                          uH = 0.59, d/s = 1.7, h = 1.00
```

```
255)  py + osm2 = osm1 + 2en    (Carrington & Harley, 1995)

  ln_K  x(CO2)  P(kbar)      T(C)     H(low) H(high)  miss   calc   2sd          summary
  2.12     -    8.3  7.7     900     -54.28  -53.87          8.00  3.59     2 (-54.73 <-> -53.41)
                                                                          cH = -54.07 (sd  1.24) 2
                                                                          within bracket
                                                                          uH = 0.56, d/s = 0.4, h = 1.00
```

```
256)  osm1 + fs = fosm + en    (Holland et al., 1996)

  ln_K  x(CO2)  P(kbar)      T(C)     H(low) H(high)  miss   calc   2sd          summary
 -1.58     -       5.0     825  925   17.36   19.00           864   116     1 (17.50 <-> 18.85)
                                                                          cH = 17.99 (sd  0.96) 2
                                                                          within bracket
                                                                          uH = 0.39, d/s = 2.1, h = 0.39
```

```
257)  fosm + crd = osm1 + fcrd    (Holland et al., 1996)

  ln_K  x(CO2)  P(kbar)      T(C)     H(low) H(high)  miss   calc   2sd          summary
     0     -       5.0     825  925    7.36    8.02           863   260     2 (7.24 <-> 8.14)
                                                                          cH = 7.61 (sd  0.85) 2
                                                                          within bracket
                                                                          uH = 0.38, d/s = 0.9, h = 0.75
```

```
258)  2sill + 38q + en + 12san = 4mliq    (Carrington & Harley, 1995)

  ln_K  x(CO2)  P(kbar)      T(C)     H(low) H(high)  miss   calc   2sd          summary
-12.26     -       8.6     885  895 -1983.56-1976.79          890    16     2 (-1985.64 <-> -1974.72)
                                                                          cH = -1980.17 (sd  5.71)
                                                                          within bracket
                                                                          uH = 4.64, d/s = 0.7, h = 1.00
```

```
259)  en + 4fliq = fs + 4mliq    (Carrington & Harley, 1995)

  ln_K  x(CO2)  P(kbar)      T(C)     H(low) H(high)  miss   calc   2sd          summary
 -2.83     -       8.6     885  895  -33.92  -33.79           891   172     2 (-35.18 <-> -32.52)
                                                                          cH = -33.84 (sd  1.16)
                                                                          within bracket
                                                                          uH = 1.13, d/s = 0.1, h = 1.00
```

260) hliq = H2O (Carrington & Harley, 1995)

ln_K	x(CO2)	P(kbar)		T(C)	H(low)	H(high)	miss	calc	2sd	summary
0.71	0	8.8	8.4	890	-21.35	-21.12		8.60	2.21	2 (-21.58 <-> -20.89)
										cH = -21.23 (sd 0.65) 2
										within bracket
										uH = 0.29, d/s = 0.4, h = 1.00

Ni-Ti-Zr–bearing equilibria

261) mag + ru = geik + CO2 (Haselton et al., 1978)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	1	13.7 12.7	950	92.52	94.31	-0.29	12.41	0.60	3 (94.05 <-> 95.66)
0	1	19.5 18.5	1100	94.12	95.64		19.02	0.73	cH = 94.85 (sd 0.55)
0	1	26.4 25.4	1250	94.71	96.03		26.29	0.85	within bracket
									uH = 0.68, d/s = -0.3, h = 1.00

262) sph + ky = an + ru (Manning & Bohlen, 1991)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	15.9 15.5	900	11.23	11.98	0.12	16.02	0.38	3 (10.21 <-> 11.84)
0	-	18.0 17.6	1000	10.79	11.54		17.88	0.39	cH = 11.00 (sd 0.36)
0	-	19.1 18.7	1050	10.50	11.24		18.83	0.39	within bracket
0	-	20.3 19.9	1100	10.03	10.77	-0.12	19.78	0.39	uH = 0.69, d/s = -0.3, h = 0.79

* ru + cc + q = sph + CO2 (Hunt & Kerrick, 1977; Jacobs & Kerrick, 1981)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0.50	2.0	490 510	76.04	77.78	-29	461	10	** NOT USED **
0	0.50	3.5	525 545	74.71	76.34	-14	511	10	cH = 73.55 (sd 0.43)
0	0.78	2.0	510 530	75.63	77.27	-25	485	10	
0	0.50	5.0	580		75.56		554	12	
0	0.97	5.0	635		75.71		604	12	

263) ru + cc + q = sph + CO2 (Jacobs & Kerrick, 1981)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0.25	6.0	540 560	73.01	74.70		546	10	3 (73.15 <-> 74.14)
0	0.48	6.0	570 580	73.09	73.85		576	12	cH = 73.55 (sd 0.43) 2
0	0.65	6.0	590 610	73.20	74.65		595	12	within bracket
0	0.82	6.0	610 630	73.25	74.65		614	12	uH = 0.42, d/s = 0.7, h = 0.40

264) 2ilm = 2iron + 2ru + O2 (O'Neill et al., 1988)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-48.06	-	0.0	800	573.91	575.64		-47.98	0.16	3 (570.57 <-> 576.45)
-42.52	-	0.0	900	573.40	574.63		-42.53	0.15	cH = 574.11 (sd 0.73)
-40.10	-	0.0	950	573.12	574.34		-40.14	0.14	within bracket
									uH = 2.50, d/s = 0.1, h = 0.23

265) 2ilm = 2iron + 2ru + O2 (Anovitz et al., 1985)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-37.88	-	0.0	1000	569.78	577.10		-37.94	0.14	3 (569.86 <-> 575.80)
-36.72	-	0.0	1025	568.41	575.90		-36.91	0.14	cH = 574.11 (sd 0.73) 2
-35.81	-	0.0	1050	569.15	576.78		-35.91	0.13	within bracket
-34.88	-	0.0	1075	569.47	577.20		-34.95	0.13	uH = 2.13, d/s = 1.4, h = 0.06
-33.96	-	0.0	1100	569.42	577.28		-34.03	0.13	
-32.93	-	0.0	1125	567.61	575.64		-33.14	0.13	

266) 2usp = 2ilm + 2iron + O2 (O'Neill et al., 1988)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-42.29	-	0.0	850	531.46	532.72		-42.32	0.28	3 (529.94 <-> 535.24)
-37.72	-	0.0	950	531.85	533.12		-37.71	0.26	cH = 532.38 (sd 1.30)
-33.85	-	0.0	1050	531.56	533.50		-33.84	0.24	within bracket
									uH = 2.25, d/s = 0.2, h = 0.91

267) 2usp = 2ilm + 2iron + O2 (Anovitz et al., 1985)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-32.01	-	0.0	1100	527.03	534.93		-32.13	0.23	1 (527.62 <-> 532.92)
-30.28	-	0.0	1150	525.11	533.29		-30.55	0.22	cH = 532.38 (sd 1.30) 2
-29.01	-	0.0	1200	527.25	535.70		-29.09	0.21	within bracket
									uH = 1.75, d/s = 1.7, h = 0.09

268) alm + 3ru = 3ilm + sill + 2q (Bohlen et al., 1983)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	11.9 11.4	750	-5.67	-4.71		11.64	0.29	3 (-5.84 <-> -4.54)
0	-	12.4 11.9	800	-5.54	-4.58		12.21	0.29	cH = -5.17 (sd 0.25)
0	-	12.7 12.3	850	-5.00	-4.22	0.09	12.79	0.29	within bracket
0	-	13.4 13.0	900	-5.18	-4.40		13.40	0.29	uH = 0.55, d/s = 0.2, h = 0.99
0	-	14.8 14.4	1000	-5.47	-4.69		14.65	0.29	
0	-	15.5 15.1	1050	-5.60	-4.83		15.28	0.29	
0	-	16.1 15.7	1100	-5.53	-4.76		15.92	0.30	

* 2alm + gr + 6ru = 6ilm + 3an + 3q (Bohlen & Liotta, 1986)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
5.32	-	10.9 10.5	800	12.30	15.94		10.50	0.18	** NOT USED **
5.32	-	12.3 11.9	900	11.22	14.87	-0.12	11.78	0.18	cH = 15.92 (sd 0.80)
5.32	-	13.5 13.1	1000	12.12	15.75	-0.02	13.08	0.18	
5.32	-	14.5 14.1	1100	14.95	18.56		14.39	0.18	

269) zrc = bdy + q (Robie et al., 1979)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	0.0	1665 1685	19.55	19.78		1675	18	1 (19.57 <-> 19.76)
									cH = 19.67 (sd 0.11)
									within bracket
									uH = 0.06, d/s = 2.0, h = 1.00

270) 2NiO = 2Ni + O2 (O'Neill, 1987)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-44.18	-	0.0	600	477.90	481.24		-44.09	0.21	3 (476.43 <-> 482.80)
-32.08	-	0.0	800	477.54	481.63		-32.00	0.17	cH = 478.89 (sd 0.76)
-27.59	-	0.0	900	477.35	481.85		-27.52	0.16	within bracket
-20.59	-	0.0	1100	476.95	482.24		-20.53	0.13	uH = 2.70, d/s = 0.6, h = 0.27

Exchange equilibria

```
271)  2mag + fa = fo + 2sid   (Dalton & Wood, 1993)

  ln_K  x(CO2)  P(kbar)     T(C)     H(low) H(high)  miss   calc   2sd       summary
 -1.32     -      20.0      1000       6.06    8.42         -1.25  0.17   1 (6.21 <-> 8.27)
                                                                         cH = 6.55 (sd  0.88) 2
                                                                         within bracket
                                                                         uH = 0.22, d/s = 5.3, h = 0.14

272)  2dol + fa = fo + 2ank   (Dalton & Wood, 1993)

  ln_K  x(CO2)  P(kbar)     T(C)     H(low) H(high)  miss   calc   2sd       summary
 -1.48     -      20.0      1000      10.70   13.47         -1.52  0.49   1 (10.75 <-> 13.42)
                                                                         cH = 12.48 (sd  2.58) 2
                                                                         within bracket
                                                                         uH = 0.22, d/s = 6.4, h = 0.72

*   dol + sid = ank + mag   (Anovitz & Essene, 1987)

  ln_K  x(CO2)  P(kbar)     T(C)     H(low) H(high)  miss   calc   2sd       summary
 -0.35     -       4.0      400        2.00    3.11         -0.42  0.47    ** NOT USED **
                                                                         cH = 2.97 (sd  1.32) 3

273)  dol + sid = ank + mag   (Rosenberg, 1967)

  ln_K  x(CO2)  P(kbar)     T(C)     H(low) H(high)  miss   calc   2sd       summary
 -0.43     -       3.0      500        2.22    4.71         -0.35  0.41   1 (2.41 <-> 4.52)
                                                                         cH = 2.97 (sd  1.32) 2
                                                                         within bracket
                                                                         uH = 0.26, d/s = 4.8, h = 0.30

*   en + 2ank = 2dol + fs   (Natural., Klein, 1978)

  ln_K  x(CO2)  P(kbar)     T(C)     H(low) H(high)  miss   calc   2sd       summary
  1.80     -       8.0      600      -16.59  -12.92  -1.15   0.40  0.71    ** NOT USED **
                                                                         cH = -4.60 (sd  2.58) 2

274)  py + ann = alm + phl   (Ferry & Spear, 1978)

  ln_K  x(CO2)  P(kbar)     T(C)     H(low) H(high)  miss   calc   2sd       summary
  5.08     -       2.0      550      -56.36  -54.07          5.11  0.29   1 (-56.18 <-> -54.66)
  4.76     -       2.0      600      -58.03  -54.46          4.65  0.27   cH = -55.41 (sd  1.00) 2
  4.26     -       2.0      650      -56.64  -54.48          4.24  0.26   within bracket
  3.82     -       2.0      700      -56.48  -53.42          3.88  0.25   uH = 0.43, d/s = 2.2, h = 0.80
  3.71     -       2.0      745      -58.80  -54.23          3.58  0.24
  3.42     -       2.0      800      -59.48  -54.37          3.25  0.22

*   py + ann = alm + phl   (Perchuk & Lavrenteva, 1983)

  ln_K  x(CO2)  P(kbar)     T(C)     H(low) H(high)  miss   calc   2sd       summary
  3.57     -       6.0      700      -53.69  -49.79  -0.21   4.02  0.25    ** NOT USED **
  2.97     -       6.0      750      -51.36  -47.27  -0.48   3.69  0.23   cH = -55.41 (sd  1.00)
  2.43     -       6.0      800      -49.04  -44.75  -0.71   3.39  0.22

275)  3fcrd + 2py = 3crd + 2alm   (Perchuk & Lavrenteva, 1983)

  ln_K  x(CO2)  P(kbar)     T(C)     H(low) H(high)  miss   calc   2sd       summary
 11.52     -       6.0      700     -145.07 -134.95         11.55  0.38   1 (-141.67 <-> -135.49)
  9.73     -       6.0      800     -143.89 -133.16          9.92  0.34   cH = -140.21 (sd  1.54) 2
  8.27     -       6.0      900     -143.16 -131.37          8.58  0.32   within bracket
  7.03     -       6.0      1000    -142.21 -129.50          7.45  0.29   uH = 0.74, d/s = 4.9, h = 0.05
```

```
276)  alm + 3cel = py + 3fcel    (Green & Hellman, 1983)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss   calc   2sd       summary
 -0.83     -      20.0     975 1025    20.45   21.39          1000   102   1 (20.50 <-> 21.34)
                                                                           cH = 20.92 (sd  0.96) 2
                                                                           within bracket
                                                                           uH = 0.29, d/s = 1.7, h = 1.00

277)  2hed + en = fs + 2di    (Lindsley, 1983)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss   calc   2sd       summary
  0.33     -      15.0       990      -12.65  -10.47  -0.25   0.68  0.24    1 (-12.55 <-> -11.76)
  0.66     -      15.0       910      -16.94  -10.93          0.80  0.26    cH = -15.26 (sd  1.27) 3
  0.68     -      15.0       810      -13.78  -11.65  -0.16   0.96  0.28    too low
                                                                           uH = 0.21, d/s = 2.4, h = 0.32

278)  2hed + fo = fa + 2di    (Perkins & Vielzeuf, 1992)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss   calc   2sd       summary
  1.60     -      10.5      1000      -25.59  -21.81          1.55  0.24    1 (-25.25 <-> -22.15)
                                                                           cH = -23.14 (sd  1.27)
                                                                           within bracket
                                                                           uH = 0.44, d/s = 4.3, h = 0.52

*   fs + fo = en + fa    (Matsui & Nishizawa, 1974)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss   calc   2sd       summary
  0.75     -      27.0      1000       -5.63   -3.17  -0.21   1.08  0.03     ** NOT USED **
                                                                           cH = -7.88 (sd  0.13) 2

279)  fs + fo = en + fa    (von Seckendorff & O'Neill, 1993)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss   calc   2sd       summary
  0.94     -      15.0       900       -8.21   -6.71          0.99  0.03    1 (-7.75 <-> -6.83)
  0.88     -      15.0      1000       -7.96   -6.68          0.93  0.03    cH = -7.88 (sd  0.13) 2
  0.80     -      15.0      1150       -7.88   -6.30  -0.00   0.87  0.02    too low but OK
                                                                           uH = 0.22, d/s = 2.6, h = 0.03

280)  2py + 3fa = 2alm + 3fo    (O'Neill & Wood, 1979)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss   calc   2sd       summary
  2.04     -      27.0      1000      -44.10  -37.67          1.93  0.29    1 (-43.69 <-> -39.30)
  1.74     -      27.0      1100      -45.02  -37.98          1.58  0.27    cH = -39.74 (sd  1.55) 2
  1.49     -      27.0      1200      -45.89  -38.69          1.28  0.25    within bracket
  1.25     -      27.0      1300      -46.69  -38.88          1.02  0.24    uH = 0.55, d/s = 4.7, h = 0.16

281)  2py + 3fa = 2alm + 3fo    (Hackler & Wood, 1989)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss   calc   2sd       summary
  1.20     -       9.1      1000      -42.39  -35.86          1.26  0.29    1 (-42.42 <-> -35.83)
                                                                           cH = -39.74 (sd  1.55) 2
                                                                           within bracket
                                                                           uH = 0.46, d/s = 7.1, h = 0.04

*   2py + 3fs = 2alm + 3en    (Lee & Ganguly, 1988)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss   calc   2sd       summary
  4.71     -      20.0       980      -68.64  -57.15          4.76  0.29     ** NOT USED **
  4.43     -      25.0      1055      -66.18  -53.44          4.75  0.28    cH = -63.39 (sd  1.53)
  4.25     -      25.0      1105      -67.04  -53.46          4.52  0.27
  3.66     -      25.0      1205      -65.02  -50.68          4.11  0.25

*   2py + 3fs = 2alm + 3en    (Kawasaki & Matsui, 1983)

  ln_K  x(CO2)  P(kbar)      T(C)      H(low) H(high)  miss   calc   2sd       summary
  5.04     -      45.0      1100      -57.15  -49.51  -0.55   5.92  0.27     ** NOT USED **
  4.04     -      45.0      1300      -55.08  -45.28  -0.64   5.05  0.23    cH = -63.39 (sd  1.53)
```

* 2py + 3fs = 2alm + 3en (Harley, 1984)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
2.98	-	27.0	1200	-54.73	-40.51	-0.71	4.26	0.25	** NOT USED **
2.80	-	23.0	1200	-55.70	-41.81	-0.63	3.99	0.25	cH = -63.39 (sd 1.53)
2.98	-	18.0	1150	-60.02	-46.29	-0.28	3.84	0.26	
3.49	-	18.0	1050	-60.51	-49.08	-0.26	4.27	0.28	
3.99	-	13.5	975	-65.43	-55.15		4.29	0.29	
4.29	-	7.5	900	-68.68	-59.54		4.22	0.31	

* 2herc + fo = 2sp + fa (Jamieson & Roeder, 1984)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-0.06	-	0.0	1300	0.39	2.19	-0.70	-0.83	0.11	** NOT USED **
									cH = 11.37 (sd 0.71) 2

* 2herc + fo = 2sp + fa (Engi, 1983)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-0.60	-	1.0	700	4.80	9.58	-0.22	-1.11	0.17	** NOT USED **
-0.31	-	1.0	800	4.09	6.02	-0.60	-1.01	0.16	cH = 11.37 (sd 0.71)
-0.79	-	1.0	900	4.10	15.69		-0.94	0.14	

282) fa + 2mft = 2mt + fo (Jamieson & Roeder, 1984)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
3.61	-	0.0	1300	-42.10	-47.40		3.53	0.64	2 (-45.06 <-> -44.44)
									cH = -43.64 (sd 4.19) 2
									too high but OK
									uH = 0.27, d/s = -10.0, h = 0.64

283) 3en + 2ann = 2phl + 3fs (Fonarev & Konilov, 1986)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
2.59	-	4.9	700	-50.43	-43.39		2.66	0.58	1 (-48.18 <-> -43.55)
2.01	-	4.9	750	-48.34	-40.49		2.37	0.56	cH = -47.44 (sd 2.36) 2
1.82	-	4.9	800	-48.42	-41.36		2.11	0.53	within bracket
									uH = 0.40, d/s = 6.1, h = 0.18

284) fact + 5di = tr + 5hed (Natural Kd)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	6.0	600	0.10	8.82	-0.89	1.49	0.56	1 (0.92 <-> 8.00)
									cH = -6.34 (sd 2.04) 2
									too low
									uH = 1.05, d/s = 4.2, h = 0.06

285) 7en + 2fanth = 2anth + 7fs (Natural Kd)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	5.0	725	20.19	37.70		0.00	4.16	1 (21.37 <-> 36.52)
									cH = 28.95 (sd 17.26) 2
									within bracket
									uH = 1.71, d/s = 5.1, h = 1.00

286) 3tr + 5fgl = 5gl + 3fact (Natural Kd)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	10.0	400	3.20	17.25	-0.83	2.09	4.59	1 (2.88 <-> 17.57)
									cH = -1.46 (sd 12.85) 2
									too low but OK
									uH = 0.93, d/s = 7.5, h = 0.59

287) 2acm + pa + 2q = 3ab + hem + H2O (Natural Tauern)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
1.16	0	10.0 8.0	450	66.05	74.21		8.99	3.80	1 (66.78 <-> 73.48)
									cH = 70.13 (sd 7.63) 2
									within bracket
									uH = 0.94, d/s = 4.3, h = 1.00

288) 5alm + 3clin = 5py + 3daph (Dickenson & Hewitt, 1986; Laird, 1989)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-34.81	-	7.0	450	222.72	244.95		-33.30	2.77	1 (224.14 <-> 236.20)
-31.46	-	7.0	500	218.29	237.62		-30.96	2.59	cH = 224.71 (sd 8.32) 2
-29.98	-	7.0	550	222.04	242.06		-28.91	2.43	within bracket
									uH = 1.81, d/s = 4.1, h = 0.47

289) 5phl + 3daph = 5ann + 3clin (Laird, 1989)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
2.03	-	6.0	550	49.27	62.64		2.55	2.54	1 (50.00 <-> 61.91)
									cH = 52.36 (sd 8.69) 2
									within bracket
									uH = 1.21, d/s = 5.5, h = 0.41

290) clin + fact = tr + daph (Laird, 1982)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
2.66	-	7.0	420	-26.64	-21.72		2.35	1.07	1 (-26.72 <-> -21.64)
									cH = -22.40 (sd 3.08) 2
									within bracket
									uH = 0.33, d/s = 7.4, h = 0.28

291) 4spr7 + 7fcrd = 4fspr + 7crd (Waters, 1986)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
12.75	-	5.5	800	-142.65	-172.89		12.75	10.33	2 (-158.94 <-> -156.59)
									cH = -157.78 (sd 46.09) 2
									within bracket
									uH = 1.00, d/s = -15.1, h = 1.00

292) 3fctd + ta = 3mctd + fta (Chinner & Dixon, 1974; Chopin & Monie, 1984; Miller, 1986)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-7.94	-	20.0	550 620	50.41	55.17	-53	497	68	5 (44.81 <-> 48.85)
-7.69	-	18.0	470 550	44.00	49.28		513	70	cH = 46.83 (sd 2.33) 2
-6.97	-	20.0	560 620	44.39	47.99		601	78	within bracket
									uH = 0.55, d/s = -2.2, h = 1.00

293) mcar + fctd = fcar + mctd (Natural, Seidel & Okrusch, 1977; Theye et al., 1992)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-1.92	-	7.0	330 430	9.08	10.60		423	64	5 (10.00 <-> 10.99)
-1.95	-	9.0	320 380	9.09	10.02	31	411	64	cH = 10.49 (sd 0.49) 2
-2.09	-	10.0	370 430	10.64	11.64	-9	361	58	within bracket
-2.04	-	17.0	420 480	11.23	12.21	-46	374	60	uH = 0.24, d/s = -2.6, h = 1.00

294) 5sud + 2daph = 5fsud + 2clin (Theye et al., 1992)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-7.53	-	10.0	375 425	54.14	58.31		400	92	1 (54.53 <-> 57.92)
									cH = 56.23 (sd 3.86) 2
									within bracket
									uH = 0.95, d/s = 2.2, h = 1.00

Mn–equilibria

295) pxmn = rhod (Maresch & Mottana, 1976)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	3.0	425 450	0.77	0.80		438	20	1 (0.77 <-> 0.80)
0	-	6.0	475 525	0.76	0.82		493	20	cH = 0.79 (sd 0.01)
0	-	20.0	900		0.96		753	20	within bracket
0	-	25.0	800 900	0.73	0.85		847	20	uH = 0.01, d/s = 2.4, h = 1.00
0	-	30.0	900 1000	0.74	0.86		940	20	

296) rhc + q = pxmn + CO2 (Peters, 1971)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	0.90	2.0	503 509	84.72	85.31	6	515	14	2 (84.83 <-> 86.06)
0	0.60	2.0	490 503	85.58	86.90		493	14	cH = 85.93 (sd 0.73) 2
									within bracket
									uH = 0.52, d/s = -0.3, h = 0.58

297) rhc = mang + CO2 (Huebner, 1969)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	1	1.0	699 713	111.37	112.85		709	8	3 (111.75 <-> 113.19)
0	1	1.5	739 757	111.72	113.54		746	8	cH = 112.39 (sd 0.43)
0	1	2.0	770 785	111.84	113.31		776	8	within bracket
									uH = 0.55, d/s = 0.9, h = 0.76

298) pxmn + rhc = teph + CO2 (Huebner & Eugster, 1968)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	1	2.0	555 570	87.32	88.74		561	14	1 (87.34 <-> 88.71)
									cH = 87.90 (sd 0.71)
									within bracket
									uH = 0.51, d/s = 1.4, h = 0.83

299) fo + 2mang = teph + 2per (Wood et al., 1994)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-1.25	-	0.0	1300	5.08	8.19		-1.26	0.15	1 (5.32 <-> 7.96)
									cH = 6.72 (sd 0.98)
									within bracket
									uH = 0.83, d/s = 1.9, h = 0.43

300) 2spss + 3fo = 2py + 3teph (Wood et al., 1994)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-5.97	-	27.0	1300	37.97	43.94		-6.15	0.78	1 (38.52 <-> 43.38)
									cH = 43.24 (sd 5.07) 2
									within bracket
									uH = 1.38, d/s = 2.2, h = 0.84

301) spss + 3ilm = alm + 3pnt (Pownceby et al., 1987)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-5.55	-	5.0	600	3.29	11.56	-0.60	-4.39	1.75	3 (-0.98 <-> 0.45)
-4.68	-	5.0	700	-3.17	7.15		-4.31	1.57	cH = -1.03 (sd 6.34) 2
-3.93	-	5.0	800	-8.97	1.88		-4.22	1.42	too low but OK
-3.34	-	5.0	900	-14.43	-2.93	-0.19	-4.12	1.30	uH = 0.51, d/s = -6.1, h = 0.80

302) phl + 3mnctd = mnbi + 3mctd (Mahar et al., 1997)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-8.95	-	4.5	550	68.82	71.49		-8.95	0.70	1 (69.11 <-> 71.20)
									cH = 70.15 (sd 2.38) 2
									within bracket
									uH = 0.47, d/s = 2.9, h = 1.00

303) 4phl + 3mnst = 4mnbi + 3mst (Mahar et al., 1997)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-37.63	-	4.5	550	327.72	337.25		-37.63	2.54	1 (328.67 <-> 336.30) cH = 332.48 (sd 8.70) 2 within bracket uH = 2.04, d/s = 2.3, h = 1.00

304) 2phl + 3mncrd = 2mnbi + 3crd (Mahar et al., 1997)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-7.77	-	4.5	550	63.22	68.95		-7.77	1.78	1 (63.41 <-> 68.76) cH = 66.08 (sd 6.09) 2 within bracket uH = 0.47, d/s = 6.1, h = 1.00

305) 5phl + 3mnchl = 5mnbi + 3clin (Mahar et al., 1997)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-0.65	-	4.5	550	25.82	37.34		-0.65	5.22	1 (23.74 <-> 39.42) cH = 31.58 (sd 17.87) 2 within bracket uH = 0.51, d/s = 11.2, h = 1.00

306) phl + spss = mnbi + py (Mahar et al., 1997)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-16.63	-	4.5	550	116.91	119.10		-16.63	0.68	1 (116.99 <-> 119.03) cH = 118.01 (sd 2.32) 2 within bracket uH = 0.73, d/s = 1.5, h = 1.00

Melting equilibria

307) di = diL (Clarke, 1966)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	0.0	1385 1395	-6.86	-6.03		1386	8	3 (-7.42 <-> -6.16)
0	-	10.0	1510 1530	-7.59	-5.86		1519	8	cH = -6.79 (sd 0.36)
0	-	20.0	1620 1640	-7.65	-5.86		1630	8	within bracket
0	-	30.0	1700 1720	-8.76	-6.94	2	1722	8	uH = 0.53, d/s = -0.1, h = 1.00
0	-	50.0	1860 1880	-7.10	-5.21		1863	8	

308) abh = abL (Clarke, 1966)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	0.0	1115 1125	0.24	0.76		1117	8	3 (-0.03 <-> 0.65)
0	-	10.0	1230 1250	-0.15	0.91		1239	8	cH = 0.32 (sd 0.20)
0	-	20.0	1310 1330	-0.79	0.29	1	1331	8	within bracket
0	-	30.0	1390 1410	-0.14	0.94		1399	8	uH = 0.29, d/s = 0.1, h = 0.77

309) san = kspL (Clarke, 1966)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	0.0	1180 1220	-7.84	-5.71		1196	10	3 (-7.37 <-> -6.61)
0	-	20.0	1440 1460	-7.56	-6.54		1451	10	cH = -6.99 (sd 0.27)
0	-	30.0	1515 1535	-7.17	-6.18		1519	10	within bracket
0	-	40.0	1540 1560	-7.72	-6.77		1556	12	uH = 0.27, d/s = 0.7, h = 1.00

310) en = enL (Clarke, 1966)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	0.0	1550 1570	4.31	6.19		1553	10	3 (3.86 <-> 5.37)
0	-	10.0	1660 1680	3.95	5.88		1667	10	cH = 4.62 (sd 0.44)
0	-	20.0	1750 1770	3.40	5.35		1763	10	within bracket
0	-	30.0	1830 1850	3.28	5.26		1844	8	uH = 0.57, d/s = 0.8, h = 1.00
0	-	50.0	1960 1980	3.48	5.48		1971	8	

311) crst = qL (Jackson, 1976)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	0.0	1716 1736	-17.07	-16.92		1718	30	1 (-17.05 <-> -16.93)
									cH = -17.05 (sd 0.11) 2
									within bracket
									uH = 0.04, d/s = 2.0, h = 0.63

312) q = qL (Jackson, 1976)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	7.0	1710 1750	-12.80	-12.45	27	1777	24	3 (-12.42 <-> -12.18)
0	-	10.0	1820 1860	-12.58	-12.20		1860	22	cH = -12.21 (sd 0.11) 2
0	-	15.0	1970 2010	-12.39	-11.97		1987	22	within bracket
0	-	20.0	2100 2140	-12.27	-11.83		2105	20	uH = 0.09, d/s = -1.1, h = 0.37

313) an = anL (Clarke, 1966)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	0.0	1545 1555	-48.34	-47.73		1548	12	1 (-48.39 <-> -47.67)
									cH = -48.16 (sd 0.37)
									within bracket
									uH = 0.30, d/s = 1.0, h = 0.81

314) an = anL (Clarke, 1966)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-1.51	-	5.0	1220 1240	-49.28	-48.11		1239	12	2 (-49.25 <-> -48.19)
-2.21	-	10.0	1105 1125	-49.29	-48.16		1125	12	cH = -48.16 (sd 0.37) 2
									too high but OK
									uH = 0.38, d/s = 1.5, h = 0.19

315) fo = foL (Clarke, 1966)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	0.0	1885 1895	9.45	10.30		1887	8	3 (9.12 <-> 10.14)
0	-	10.0	1940 1960	9.07	10.73		1947	8	cH = 9.63 (sd 0.33)
0	-	20.0	1980 2000	7.93	9.56	1	2001	8	within bracket
0	-	30.0	2030 2050	8.02	9.62		2050	8	uH = 0.43, d/s = 0.1, h = 1.00
0	-	50.0	2130 2150	9.15	10.72		2136	8	

316) fa = faL (Clarke, 1966)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	0.0	1200 1222	41.76	43.44		1216	8	3 (42.38 <-> 43.52)
0	-	10.0	1265 1285	42.12	43.61		1276	8	cH = 42.95 (sd 0.32)
0	-	20.0	1323 1343	42.16	43.60		1334	8	within bracket
0	-	30.0	1380 1400	42.30	43.69		1389	10	uH = 0.42, d/s = 0.9, h = 1.00
0	-	50.0	1490 1510	42.65	43.95		1495	10	

317) sill = sillL (estimate)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
0	-	0.0	1700 1710	80.14	80.91		1705	14	1 (80.07 <-> 80.98)
									cH = 80.53 (sd 0.52)
									within bracket
									uH = 0.39, d/s = 1.0, h = 1.00

318) h2oL = H2O (Goldsmith & Jenkins, 1985)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
1.90	0	0.9 0.9	900	22.80	23.56	-0.21	0.64	0.04	6 (25.35 <-> 25.89)
1.43	0	2.2 1.8	820	23.81	24.75	-0.30	1.50	0.13	cH = 25.62 (sd 0.21) 2
1.20	0	3.2 2.8	785	24.80	25.36	-0.17	2.63	0.26	within bracket
1.02	0	4.2 3.8	760	25.70	26.11	0.08	4.28	0.42	uH = 0.23, d/s = -4.8, h = 1.00
0.94	0	5.2 4.8	750	25.64	25.99	0.03	5.23	0.49	
0.87	0	6.2 5.8	735	25.73	26.03	0.14	6.34	0.56	
0.73	0	8.2 7.8	715	25.76	26.03	0.22	8.42	0.64	
0.62	0	11.3 10.7	685	25.24	25.60	-0.03	10.67	0.70	

319) abh = abL (Goldsmith & Jenkins, 1985)

ln_K	x(CO2)	P(kbar)	T(C)	H(low)	H(high)	miss	calc	2sd	summary
-1.16	-	1.0	890 910	-0.23	0.88		900	8	3 (-0.11 <-> 0.84)
-1.68	-	2.0	810 830	-0.55	0.58		825	8	cH = 0.32 (sd 0.20) 2
-2.07	-	3.0	775 795	0.30	1.47		775	6	within bracket
-2.30	-	4.0	750 770	0.21	1.40		752	6	uH = 0.34, d/s = 0.4, h = 0.23
-2.39	-	5.0	740 760	-0.27	0.92		750	6	
-2.56	-	6.0	725 745	-0.25	0.95		735	6	
-2.86	-	8.0	705 725	-0.09	1.14		712	6	
-3.22	-	11.0	675 695	-0.64	0.61		690	6	

Reference list for Table 7.

Ackermand, D., Seifert, F., & Schreyer, W., 1975. Instability of sapphirine at high pressure. *Contributions to Mineralogy and Petrology*, **50**, 79-92.

Allen, J.M. & Fawcett, J.J., 1982. Zoisite-anorthite-calcite stability relations in H_2O-CO_2 fluids at 5000 bars: An experimental and SEM study. *Journal of Petrology* **23**, 215-239.

Anovitz, L.M. & Essene, E.J., 1987. Phase equilibria in the system $CaCO_3$-$MgCO_3$-$FeCO_3$. *Journal of Petrology* **28**, 389-414.

Anovitz, L.M., Treiman, A.H., Essene, E.J., Hemingway, B.S., Westrum, E.F.Jr., Wall, V.J., Burriel, R. & Bohlen, S.R., 1985. The heat capacity of ilmenite and phase equilibria in the system Fe-Ti-O. *Geochimica et Cosmochimica Acta* **49**, 2027-2040.

Aranovich, L.Y. & Newton, R.C., 1996. H_2O activity in concentrated NaCl solutions at high pressures and temperatures measured by the brucite-periclase equilibrium. *Contributions to Mineralogy and Petrology*, **125**, 200–212.

Baker, E.H., 1962. Calcium oxide–carbon dioxide system in the pressure range 1–300 atmospheres. *Journal of the Chemical Society (London)*, **1962**, 464–470.

Baker, J. & Newton, R.C., 1994. Standard thermodynamic properties of meionite, $Ca_4Al_6Si_6O_{24}CO_3$, from experimental phase equilibria. *American Mineralogist*, **79**, 478–484.

Baker, J., & Holland, T.J.B., 1996. Experimental reversals of chlorite compositions in divariant MgO-Al_2O_3-SiO_2-H_2O assemblages : implications for order-disorder in chlorites. *American Mineralogist*, **81**, 676–684.

Barnes, H.L. & Ernst, W.G., 1963. Ideality and ionization in hydrothermal fluids. The system MgO-H_2O-NaOH. *American Journal of Science* **261**, 129-150.

Bird, G.W., & Fawcett, J.J., 1973. Stability relations of Mg-chlorite-muscovite and quartz between 5 and 10 kbar water pressure. *Journal of Petrology* **14**, 415-428.

Boettcher, A.L. & Wyllie, P.J., 1968. Jadeite stability measured in the presence of silicate liquids in the system $NaAlSiO_4$–SiO_2–H_2O. *Geochimica et Cosmochimica Acta*, **32**, 999–1012.

Boettcher, A.L., 1970. The system CaO-Al_2O_3-SiO_2-H_2O at high temperatures and pressures. *Journal of Petrology*, **11**, 337-339.

Bohlen, S.R. & Boettcher, A.L., 1982. The quartz-coesite transformation: A precise determination and the effects of other components. *Journal of Geophysical Research* , 7073–7078.

Bohlen, S.R. & Liotta, J.J., 1986. A barometer for garnet amphibolites and garnet granulites. *Journal of Petrology* **27**, 1025-1034.

Bohlen, S.R., Boettcher, A.L., Wall, V.J. & Clemens, J.D., 1983. Stability of phlogopite-quartz and sanidine-quartz: A model for melting in the lower crust. *Contributions to Mineralogy and Petrology* **83**, 270-277.

Bohlen, S.R., Dollase, W.A. & Wall, V.J., 1986. Calibration and applications of spinel equilibria in the system FeO-Al_2O_3-SiO_2. *Journal of Petrology* **27**, 1143-1156.

Bohlen, S.R., Essene, E.J. & Boettcher, A.L., 1980. Reinvestigation and application of olivine-quartz-orthopyroxene barometry. *Earth and Planetry Science Letters,* **47**, 1-10.

Bohlen, S.R., Montana, A., Kerrick, D.M.,1991. Precise determination of the equilibria kyanite = sillimanite and kyanite = andalusite and a revised triple point for Al2SiO5 polymorphs. *American Mineralogist,* **76**, 677-680.

Bohlen, S.R., Wall, V.J. & Boettcher, A.L., 1983. Experimental investigation and application of garnet granulite equilibria. *Contributions to Mineralogy and Petrology* **83**, 52-61.

Bohlen, S.R., Wall, V.J. & Boettcher, A.L., 1983. Experimental investigations and geological applications of equilibria in the system FeO-TiO_2-Al_2O_3-SiO_2-H_2O. *American Mineralogist* **68**, 1049-1058.

Bose, K. & Ganguly, J., 1995. Quartz-coesite transition revisited. reversed experimental determination at 500–1200°C and retrieved thermochemical properties. *American Mineralogist*, **80**, 231–238.

Bowman A.F., 1975. An investigation of Al_2SiO_5 phase equilibrium utilizing the scanning electron microscope. 80p. MS thesis, Univ Oregon, Eugene, Oregon.

Boyd, F.R., 1959. Hydrothermal inveatigations of amphiboles. In: *Researches in Geochemistry,* 1 (ed. Abelson, P.H.). Wiley. New York.

Brey, G., Brice, W.R., Ellis, D.J., Green, D.H., Harris, K.L. & Ryabchikov, I.D., 1983. Pyroxene-carbonate reactions in the upper mantle. *Earth and Planetary Science Letters,* **62**, 63–74.

Burton, J.C., Taylor, L.A. and Chou, I-M, 1982. The f_{O2}-T and f_{S2}-T stability relations of hedenbergite and of hedenbergite-johanseite solid solutions. *Economic Geol*.ogy, **77**, 764-783.

Carman, J.H., & Gilbert, M.C., 1983. Experimental studies on glaucophane stability. *American Journal of Science* **283A**, 414-437.

Carpenter M.A. & Salje E.K.H., 1994. Thermodynamics of non-convergent cation ordering in minerals, III: order parameter coupling in K-feldspar. *American Mineralogist,* **79**, 1084–1098.

Carrington, D.P. & Harley, S.L., 1995. Partial melting and phase relations in high-grade metapelites: an experimental petrogenetic grid in KFMASH system. *Contributions to Mineralogy and Petrology,* **120**, 270-291.

Chamberlin L., Beckett J.R. & Stolper E., 1995. Palladium oxide equilibration and the thermodynamic properties of $MgAl_2O_4$ spinel. *American Mineralogist,* **80**, 285–296.

Chatterjee, N.D., & Johannes, W., 1974. Thermal stability and standard thermodynamic properties of synthetic 2M1-muscovite, $KAl_2AlSi_3O_{10}(OH)_2$. *Contributions to Mineralogy and Petrology* , **48**, 89-114.

Chatterjee, N.D., 1970. Synthesis and upper stability of paragonite. *Contributions to Mineralogy and Petrology,* **27**, 244-257.

Chatterjee, N.D., 1972. The upper stability limit of the assemblage paragonite + quartz and its natural occurrences. *Contributions to Mineralogy and Petrology* **34**, 288-303.

Chatterjee, N.D., 1974. Synthesis and upper thermal stability limit of 2M-margarite, $CaAl_2Al_2Si_2O_{10}(OH)_2$. *Schweizerische Mineralogische Petrologische Mitteilungen* , **54**, 753-767.

Chatterjee, N.D., Johannes, W. & Leistner, H., 1984. The system $CaO-Al_2O_3-SiO_2-H_2O$: New phase equilibria data, some calculated phase relations, and their petrological applications. *Contributions to Mineralogy and Petrology,* **88**, 1-13.

Chernosky, J.V. & Autio, L.K. 1979. The stability of anthophyllite in the presence of quartz. *American Mineralogist* **84**, 294-300.

Chernosky, J.V. & Berman, R.G., 1986. Experimental reversal of the equilibrium: Clinochlore : 2 magnesite = 3 forsterite + spinel + $2CO_2$ + $4H_2O$. *EOS (Transactions of the American Geophysical Union),* **67**, 1279.

Chernosky, J.V. & Berman, R.G., 1986. The stability of clinochlore in mixed volatile, CO_2-H_2O fluids. *EOS (Transactions of the American Geophysical Union),* **67**, 407.

Chernosky, J.V. & Berman, R.G., 1991. Experimental reversal of the equilibrium andalusite + calcite = anorthite + CO_2. *Canadian Mineralogist,* **29**, 791–802.

Chernosky, J.V., 1973. The stability of chrysotile, $Mg_3Si_2O_5(OH)_4$, and the free energy of formation oftalc, $Mg_3Si_4O_{10}(OH)_2$. *Geological Society of America Abstracts with Programs*, **5**, 575.

Chernosky, J.V., 1974. The upper stability of clinochlore at low pressure and the free energy of formation of Mg-cordierite. *American Mineralogist* **59**, 496-507.

Chernosky, J.V., 1976. Gibbs free energy of enstatite, clinochlore and hydrous Mg-cordierite evaluated from phase equilibrium data. *EOS (Transactions of the American Geophysical Union),*. **57**, 1020.

Chernosky, J.V., 1976. The stability of anthophyllite - a re-evaluation based onnew experimental data. *American Mineralogist,* **61**, 1145-1155.

Chernosky, J.V., 1978. The stability of clinochlore and quartz at low pressure. *American Mineralogist* **63**, 73-82.

Chernosky, J.V., Day, H.W. & Caruso, L.J., 1985. Equilibria in the system MgO- SiO_2-H_2O: experimental determination of the stability of Mg-anthophyllite. *American Mineralogist* **70**, 223-236.

Chinner, G.A., & Dixon, J.E., 1974. Some high pressure parageneses of the Allalin Gabbro, Valais, Switzerland. *Journal of Petrology,* **14,** 185-202.

Cho, M., Maruyama, S. & Liou, J.G., 1987. An experimental investigation of heulandite-laumontite equilibrium at 1000 and 2000 bar P_{fluid}. Contributions to Mineralogy and Petrology, 97, 43–50.

Chopin, C., & Monie, P., 1984. A unique magnesiochloritoid-bearing, high pressure assemblage from the Monte Rosa: a petrologic and ^{40}Ar-^{39}Ar study. *Contributions to Mineralogy and Petrology* **87**, 388-398.

Chopin, C. & Schreyer, W., 1983. Magnesiocarpholite and magnesiochloritoid: Two index minerals of pelitic blueschists and their preliminary phase relations in the model system $MgO-Al_2O_3-SiO_2-H_2O$. *American Journal of Science* **283A**, 72-96.

Chopin, C. & Sobolev, N.V., 1995. Principal mineralogical indicators of UHP in crustal rocks. in Ultrahigh pressure metamorphism (eds R.G. Coleman and X. Wang), 96–131. Cambridge University Press.

Chou, I.-M., 1978. Calibration of oxygen buffers at elevated P and T using the hydrogen fugacity buffer. *American Mineralogist*, **63**, 690-703.

Clark, S.P., 1966. High pressure phase equilibria. In: Clarke, S.P. (ed), Handbook of physical constants. *Geological Society of America Memoir*, **97**, 345–370.

Conolly, J.A.D. & Kerrick, D.M., 1985. Experimental and thermodynamic analysis of prehnite. *EOS* , **66**, 388.

Crawford, W.A. & Fyfe, W.S. 1965. Lawsonite equilibria. *American Journal of Science* **263**, 262-270.

Dalton, J.A. & Wood, B.J., 1993. The partitioning of Fe and Mg between olivine and carbonate and the stability of carbonate under mantle conditions. *Contributions to Mineralogy and Petrology*, **114**, 501–509.

Danckwerth, P., & Newton, R.C., 1978. Experimental determination of the spinel peridotite to garnet peridotite reaction in the system $MgO-Al_2O_3-SiO_2$ in the range 900°C-1100°C and Al_2O_3 isopleths of enstatite in the spinel field. *Contributions to Mineralogy and Petrology*, **66**, 189-200.

Dickenson, M.P. & Hewitt, D., 1986. A garnet-chlorite geothermometer. *Geological Society of America Abstracts with Programs*, **18**, 584.

Doroshev, A.M. & Malinovskiy, I.Y., 1974. Upper pressure limit of stability of sapphirine. *Doklady Akad. Nauk SSSR*, **219**, 136–138.

Duffy, C.J. & Greenwood, H.J., 1979. Phase equilibria in the system $MgO-MgF_2-SiO_2-H_2O$. *American Mineralogist*, **64**, 1156–1174.

Dutrow, B.L. & Holdaway, M.J. (1989): Experimental determination of the upper thermal stability of Fe-staurolite + quartz at medium pressures. *Journal of Petrology* , **30**, 229-248.

Eggert, R.G. & Kerrick, D.M., 1981. Metamorphic equilibria in the siliceous dolomite system: 6 kbar experimental data and geologic implications. *Geochimica et Cosmochimica Acta* **45**, 1039-1049.

Eggler, D.H., Kushiro, I. & Holloway, J.R., 1976. Free energies of decarbonation reactions at mantle pressures 1. Stability of the assemblage forsterite-enstatite-magnesite in the system $MgO-SiO_2-CO_2-H_2O$. *American Mineralogist*, **64**, 288–293.

Engi, M., 1983. Equilibria involving Al-Cr spinel: Mg-Fe exchange with olivine. Experiments, thermodynamic analysis, and consequences for geothermometry. *American Journal of Science*, **283-A**, 29–71.

Ernst, W.G., 1962. Synthesis, stability relations, and occurrence of riebeckite and riebeckite-arfvedsonite solid solutions. *Journal of Geology*, **70**, 689–736.

Ernst, W.G., 1966. Synthesis and stability relations of ferrotremolite. *American Journal of Science*, **264**, 37–65.

Essene, E., Boettcher, A.L., Furst, G.A. 1972. Indirect measurements of ΔG for quartz + corundum = kyanite. *EOS*, **53**, 554.

Evans, B.W., Johannes, W., Oterdoom, W.H., & Trommsdorff, V., 1976. Stability of chrysotile and antigorite in the serpentine multisystem. *Schweizerische Mineralogische Petrologische Mitteilungen*, **56**, 79–93.

Fawcett, J.J. & Yoder, H.S., 1966. Phase relationships of chlorites in the system MgO-Al_2O_3-SiO_2-H_2O. *American Mineralogist* **61**, 303-310.

Ferry, J.M. & Spear, F.S., 1978. Experimental calibration of the partitioning of Fe and Mg between biotite and garrnet. *Contributions to Mineralogy and Petrology* **66**, 113-117.

Fonarev, V.I. & Konilov, A.N., 1986. Experimental study of Fe-Mg distribution between biotite and orthopyroxene. *Contributions to Mineralogy and Petrology* **93**, 227-235.

Fonarev, V.I. & Korolkov, G.J., 1980. The assemblage orthopyroxene +cummingtonite + quartz. The low-temperature stability limit. *Contributions to Mineralogy and Petrology*, **73**, 413–420.

Ganguly, J. & Newton, R.C., 1968. Thermal stability of chloritoid at high pressures and relatively high oxygen fugacities. *Journal of Petrology* **9**, 444-466.

Ganguly, J., 1969. Chloritoid stability and related paragenesis: Theory, experiments and applications. *American Journal of Science*, **267**, 910-944.

Ganguly, J., 1972. Staurolite stability and related paragenesis: Theory, experiments and applications. *Journal of Petrology* **13**, 335-365.

Gasparik, T. & Newton, R.C., 1984. The reversed alumina contents of orthopyroxene in equilibrium with spinel and forsterite in the system MgO-Al_2O_3-SiO_2. *Contributions to Mineralogy and Petrology* **85**, 186-196.

Gasparik, T., 1984. Experimental study of subsolidus phase relations and mixing properties of pyroxene in the system CaO-Al_2O_3-SiO_2. *Geochimica et Cosmochimica Acta*, **48**, 2537-2545.

Gasparik, T., 1984. Experimental study of subsolidus phase relations and mixing properties of pyroxene in the system CaO-Al_2O_3-SiO_2. *Geochimica et Cosmochimica Acta*, **48**, 2537–2545.

Gasparik, T., 1985. Experimental study of subsolidus phase relations and mixing properties of pyroxene and plagioclase in the system Na_2O-CaO-Al_2O_3-SiO_2. *Contributions to Mineralogy and Petrology* **89**, 346-357.

Goldsmith, J.R. & Heard, H.C., 1962. Subsolidus phase relations in the system $CaCO_3$-$MgCO_3$. *Journal of Geology,*, **69**, 45-74.

Goldsmith, J.R. & Jenkins, D.M., 1985. The hydrothermal melting of low and high albite. *American Mineralogist*, **70**, 924–933.

Goldsmith, J.R., & Newton, R.C., 1977. Scapolite-plagioclase stability relations at high pressures and temperatures in the system $NaAlSi_3O_8$-$CaAl_2Si_2O_8$-$CaCO_3$-$CaSO_4$. *American Mineralogist* **62**, 1063-1081.

Goldsmith, J.R., 1980. The melting and breakdown reactions of anorthite at high pressures and temperatures. *American Mineralogist* **65**, 272-284.

Goldsmith, J.R., 1980. Thermal stability of dolomite at high temperatures and pressures. *Journal of Geophysical Research* **85**, 6949-6954.

Goldsmith, J.R., 1981. The join $CaAl_2Si_2O8$-H_2O (anorthite-water) at elevated pressures and temperatures. *American Mineralogist* **66**, 1183-1188.

Gordon, T.M. & Greenwood, H.J., 1970. The reaction: dolomite + quartz + water = talc + calcite + carbon dioxide. *American Journal of Science* **268**, 225-242.

Green, T.H. & Hellman, P.L., 1982. Fe-Mg partitioning between coexisting garnet and phengite at high pressure, and comments on a garnet-phengite geothermometer. *Lithos*, **15**, 253-266.

Goldsmith, J.R. & Jenkins D.M., 1985. The hydrothermal melting of low and high albite. American Mineralogist, **70**, 924–933.

Greenwood, H.J., 1967. Mineral equilibria in the system MgO-SiO_2-H_2O-CO_2. In, *Researches in Geochemistry II* (ed. P.H. Abelson). Wiley.

Greenwood, H.J., 1967. Wollastonite: Stability in H_2O-CO_2 mixtures and occurrence in a contact-metamorphic aureole near Salmo, British Columbia, Canada. *American Mineralogist*, **52**, 1669-1680.

Grevel, K.-D., Fockenberg, T., Wunder, B. & Burchard, M., 1994. Experimental determination of the equilibrium curve 2 diaspore = corundum + H_2O to high pressures and modified thermodynamic data for diaspore. *Terra Nova Abstract Supplement*, 20.

Gustafson, W., 1974. The stability of andradite, hedenbergite, and related minerals in the system Ca-Fe-Si-O-H. *Journal of Petrology*, **15**, 455–496.

Haas, H. & Holdaway, M.J., 1973. Equilibria in the system Al_2O_3-SiO_2-H_2O involving the stability limits of pyrophyllite and the thermodynamic data of pyrophyllite. *American Journal of Science* **273**, 449-464.

Haas, H., 1972. Diaspore-corundum equilibrum determined by epitaxis of diaspore on corundum. *American Mineralogist* **57**, 1375-1385.

Hackler, R.T. & Wood, B.J., 1989. Experimental determination of Fe and Mg exchange between garnet and olivine and estimation of Fe-Mg mixing properties in garnet. *American Mineralogist*, **74**, 994–999.

Harker, R.I. & Tuttle, O.F., 1955. Studies in the system CaO-MgO-CO_2. Part 1: the thermal dissociation of calcite, dolomite and magnesite. *American Journal of Science* **253**, 209-224.

Harker, R.I. & Tuttle, O.F., 1956. Experimental data on the P_{CO_2}-T curve for the reaction: calcite + quartz = wollastonite + carbon dioxide. *American Journal of Science* **254**, 239-256.

Harley, S.L., 1984. An experimental study of the partitioning of Fe and Mg between garnet and orthopyroxene. *Contributions to Mineralogy and Petrology* **86**, 359-373.

Harlov, D.E. & Newton, R.C., 1993. Reversal of the metastable kyanite + corundum + quartz and andalusite + corundum + quartz equilibria and the enthalpy of formation of kyanite and andalusite. *American Mineralogist*, **78**, 594–600.

Harlov, D.E. & Newton, R.C., 1993. Reversal of the metastable kyanite + corundum + quartz and andalusite + corundum + quartz equilibria and the enthalpy of formation of kyanite and andalusite. *American Mineralogist*, **78**, 594–600.

Haselton, H.T. Jr., Sharp, W.R. & Newton, R.C., 1978. CO_2 fugacity at high temperatures and pressures from experimental decarbonation reactions. *Geophysical Research Letters,* **5**, 753-756.

Hays, J.F., 1967. Lime-alumina-silica. *Carnegie Institute of Washington Yearbook*, **65**, 234-239.

Heinrich, W. & Althaus, E., 1980. Die obere Stabilitätsgrenze von Lawsonit plus Albit bzw Jadeit. *Fortschritte der Mineralogie*, **58**, 49-50.

Hemley, J.J., Marinenko, J.W. & Luce, R.W., 1980. Equilibria in the system Al_2O_3-SiO_2-H_2O and some general implications for alteration/mineralisation processes. *Economic Geology*, **75**, 210–228.

Hensen, B.J & Essene, E.J. 1971. Stability of pyrope-quartz in the system MgO-Al_2O_3-SiO_2. *Contributions to Mineralogy and Petrology* **30**, 72-83.

Hensen, B.J., 1972. Phase relations involving pyrope, enstatite$_{ss}$, and sapphirine$_{ss}$ in the system MgO-Al_2O_3-SiO_2. *Carnegie Institution of Washington Yearbook*, **71**, 421.

Hertzberg, C.T., 1983. The reaction forsterite + cordierite = aluminous orthopyroxene + spinel in the system MgO-Al_2O_3-SiO_2. *Contributions to Mineralogy and Petrology* **84**, 84-90.

Hewitt, D.A., 1973. Stability of the assemblage muscovite-calcite-quartz. *American Mineralogist* **58**, 785-791.

Hewitt, D.A., 1975. Stability of the assemblage phlogopite-calcite-quartz. *American Mineralogist* **60**, 391-397.

Hewitt, D.A., 1978. A redetermination of the fayalite-magnetite-quartz equilibrium between 650° and 850°C. *American Journal of Science*, **278**, 715-724.

Hochella, M.F., Liou, J.G., Keskinen, M.J. & Kim, H.S., 1982. Synthesis and stability relations of magnesian idocrase. *Economic Geology*, **77**, 798-808.

Hoffmann, C., 1972. Natural and synthetic ferroglaucophane. *Contributions to Mineralogy and Petrology*, **34**, 135-149.

Holdaway, M.J. & Lee, S.M., 1977. Fe-Mg cordierite stability in high-grade pelitic rocks based on experimental, theoretical and natural observations. *Contributions to Mineralogy and Petrology*, **63**, 175–198.

Holdaway, M.J., 1971. Stability of andalusite and the aluminum silicate phase diagram. *American Journal of Science* **271**, 97-131.

Holdaway, M.J., 1972. Thermal stability of Al-Fe epidote as a function of fO_2 and Fe content. *Contributions to Mineralogy and Petrology* **37**, 307–340.

Holland, T.J.B., 1979. Experimental determination of the reaction paragonite = jadeite + kyanite + quartz + water, and internally consistent thermodynamic data for part of the system Na_2O-Al_2O_3-SiO_2-H_2O, with applications to eclogites and blueschists. *Contributions to Mineralogy and Petrology*, **68**, 293-301.

Holland, T.J.B., 1980. The reaction albite = jadeite + quartz determined experimentally in the range 600-1200°C. *American Mineralogist* **65**, 129-134.

Holland, T.J.B. & Ray, N.J., 1985. Glaucophane and pyroxene breakdown reactions in the Pennine units of the eastern Alps. *Journal of Metamorphic Geology*, **3**, 417--438.

Holland, T.J.B., Babu, E.V.S.S.K, & Waters, D.J., 1996. Phase relations of Osumilite and dehydration melting in pelitic rocks: a simple thermodynamic model for the KFMASH system. *Contributions to Mineralogy and Petrology* **124**, 383–394.

Hoschek, G., 1974. Gehlenite stability in the system CaO-Al_2O_3-SiO_2-H_2O-CO_2. *Contributions to Mineralogy and Petrology* **47**, 245-254.

Hoschek, G., 1995. Stability relations and Al content of tremolite and talc in CMASH assemblages with kyanite + zoisite + quartz + H_2O. *European Journal of Mineralogy*, **7**, 353–362.

Huang, W.L. & Wyllie, P.J., 1975. Melting and subsolidus phase relationships for $CaSiO_3$ to 35 kilobars pressure. *American Mineralogist* **60**, 213-217.

Huckenholz, H.G. & Yoder, H.S., 1971. Andradite stability relations in the $CaSiO_3$-Fe_2O_3 join up to 30 kb. *Neues Jahrbuch für Mineralogie Abhandlungen*, **114**, 246-280.

Huckenholz, H.G., Holzl, E., & Lindhuber, W., 1975. Grossularite, its solidus and liquidus relations in the system CaO-Al_2O_3-SiO_2-H_2O up to 10 kbars. *Neues Jahrbuch für Mineralogie Abhandlungen*, **124**, 1-46.

Huebner, J.S., & Eugster, H.P., 1968. Rhodachrosite decarbonation in the system MnO-SiO_2-CO_2. *Geological Society of America Special Publication* **121,** 144-145.

Huebner, J.S., 1969. Stability relations of rhodachrosite in the system manganese-carbon-oxygen. *American Mineralogist* **54**, 457-481.

Hunt, J.A., & Kerrick, D.M., 1977. The stability of sphene: experimental redetermination and geological implications. *Geochimica et Cosmochimica Acta*, **41**, 279-288.

Irving, A.J. & Wyllie, P.J., 1975. Subsolidus and melting relationships for calcite, magnesite, and the join $CaCO_3$-$MgCO_3$ to 36 kb. *Geochimica et Cosmochimica Acta*, **39**, 35-53.

Irving, A.J., Huang, W.L. & Wyllie, P.J., 1977. Phase relations of portlandite, $Ca(OH)_2$ and brucite, $Mg(OH)_2$ to 33 kilobars. *American Journal of Science* **277**, 313-321.

Jackson, I., 1976. Melting of the silica isotypes SiO_2, BeF_2 and GeO_2 at elevated pressures. *Physics of the Earth and Planetary Interiors*, **13**, 218–231.

Jacobs, G.K. & Kerrick, D.M., 1981. Devolatilisation equilibria in H_2O-CO_2 and H_2O-CO_2-NaCl fluids: an experimentaland thermodynamic evaluation at elevated pressures and temperatures. *American Mineralogist* **66**, 1135-1153.

Jamieson, H.E. & Roeder, P.L., 1984. The distribution of Mg and Fe^{2+} between olivine and spinel at 1300°C. *American Mineralogist*, 69, 283–291.

Jenkins, D.M. & Chernosky, J.V. Jr., 1986. Phase equilibria and crystallochemical properties of Mg-chlorite. *American Mineralogist* **71**, 924-936.

Jenkins, D.M., 1981. Experimental phase relations of hydrous peridotitesmodelled in the system H_2O-CaO-MgO-SiO_2. *Contributions to Mineralogy and Petrology*, **77**, 166-176.

Jenkins, D.M., 1983. Stability and composition relations of calcic amphiboles in ultramafic rocks. *Contributions to Mineralogy and Petrology,* **83**, 375-384.

Jenkins, D.M., 1984. Upper pressure stability of synthetic margarite + quartz. *Contributions to Mineralogy and Petrology,* **88**, 332-339.

Jenkins, D.M., 1994. Experimental reversals of the aluminum content of tremolitic amphiboles in the system H_2O-CaO-MgO-Al_2O_3-SiO_2. *American Journal of Science*, **294**, 593–620.

Jenkins, D.M., Holland, T.J.B. & Clare, A.K., 1991. Experimental Determination of the Pressure-Temperature Stability Field and Thermochemical Properties of Synthetic Tremolite. *American Mineralogist*, **76**, 458–469.

Jenkins, D.M., Holland, T.J.B. & Clare, A.K., 1991. Experimental determination of the pressure–temperature stability field and thermochemical properties of synthetic tremolite. *American Mineralogist*, **76**, 458–469.

Jenkins, D.M., Newton, R.C., & Goldsmith, J.G., 1983. Fe-free clinozoisite stability relative to zoisite. *Nature*, **304**, 622-623.

Johannes, W. & Metz, P., 1968. Experimentelle Bestimmung von Gleichgewichtsbeziehungen im System MgO-CO_2-H_2O. *Neues Jahrbuch fur Mineralogie Monatshefte*, **112**, 15–26.

Johannes, W. 1968. Experimental investigation of the reaction forsterite + H_2O = serpentine + brucite. *Contributions to Mineralogy and Petrology*, **19**, 309-315.

Johannes, W., & Puhan, D., 1971. The calcite-aragonite transition re-investigated. *Contributions to Mineralogy and Petrology*, **31**, 28-38.

Johannes, W., 1969. An experimental investigation of the system MgO-SiO_2-H_2O-CO_2. *American Journal of Science* **267**, 1083-1104.

Johannes, W., 1980. Melting and subsolidus reactions in the system K_2O-CaO-Al_2O_3-SiO_2-H_2O. *Contributions to Mineralogy and Petrology*, **74**, 29-34.

Johannes, W., 1984. Beginning of melting in the granite system Qz-Or-Ab-An-H_2O. *Contributions to Mineralogy and Petrology*, **86**, 264-273.

Kase, H.-R. & Metz, P. 1980. Experimental investigation of the metamorphism of siliceous dolomites. *Contributions to Mineralogy and Petrology*, **73**, 151-159.

Kawasaki, T. & Matsui, Y., 1983. Thermodynamic analysis of equilibria involving olivine, orthopyroxene and garnet. *Geochimica et Cosmochimica Acta* **47**, 1661-1680.

Kerrick, D.M. & Heninger, S.G., 1984. The andalusite-sillimanite equilibrium revisited. *Geological Society of America Abstracts with programs*, **16**, 558.

Kerrick, D.M. 1968. Experiments on the upper stability limits of pyrophyllite at 1.8 kbar and 3.9 kbar water pressure. *American Journal of Science* **266**, 204-214.

Kitahara, S., Takenouchi, S. & Kennedy, G.C., 1966. Phase relations in the system MgO-SiO_2-H_2O at high temperatures and pressures. *American Journal of Science* **264**, 223-233.

Klein, C., 1978. Regional metamorphism of Proterozoic iron-formation, Labrador Trough, Canada. *American Mineralogist* **63**, 898-912.

Koziol, A. & Newton, R.C., 1986. Definition of anorthite = grossular + kyanite + quartz in the range 650-1250°C. *Geological Society of America abstracts with programs*, **188**, 661.

Koziol, A.M. & Newton, R.C., 1995. Experimental determination of the reactions magnesite + quartz = enstatite + CO_2 and magnesite = periclase + CO_2, and enthalpies of formation of enstatite and magnesite. *American Mineralogist*, **80**, 1252–1260.

Koziol, A.M., 1994. Personal communication.

Laird, J., 1982. Amphiboles in metamorphosed basaltic rocks. In Amphiboles, *MSA Reviews in Mineralogy*, **9B**, 113–158.

Laird, J., 1989. Chlorites: Metamorphic petrology. In Hydrous phyllosilicates (exclusive of micas), *MSA Reviews in Mineralogy*, **19**, 405-453.

Lattard, D. & Evans, B.W., 1992. New experiments on the stability of grunerite. *European Journal of Mineralogy*, **4**, 219–238.

Lattard, D. & LeBreton, N., 1994. The P-T-fO_2 stability of endmember deerite, $Fe_{12}Fe_6Si_{12}O_{40}(OH)_{10}$. *Contributions to Mineralogy and Petrology*, **115**, 474–487.

Lee, H.Y. & Ganguly, J., 1988. Equilibrium compositions of coexisting garnet and orthopyroxene: experimental determinations in the system FeO-MgO-Al_2O_3-SiO_2, and applications. *Journal of Petrology* **29**, 93-113.

Lindsley, D.H., 1966. P-T projection for part of the system kalsilite-silica. *Carnegie Institute of Washington Yearbook*, **65**, 244-247.

Lindsley, D.H., 1983. Pyroxene thermometry. *American Mineralogist*, **68**, 477-493.

Lindsley, D.H., & Munoz, J.L. 1969. Subsolidus relations along the join hedenbergite-ferrosilite. *American Journal of Science*, **267-A**, 295–324

Liou, J.G., 1970. Synthesis and stability relations of wairakite $CaAl_2Si_4O_{12}.2H_2O$. *Contributions to Mineralogy and Petrology*, **27**, 259–282.

Liou, J.G., 1971. Stilbite-laumontite equilibrium. *Contributions to Mineralogy and Petrology*, **31**, 171–177.

Liou, J.G., 1971. P-T stabilities of laumontite, wairakite, lawsonite, and related minerals in the system $CaAl_2Si_2O_8$-SiO_2-H_2O. *Journal of Petrology*, **12**, 379–411.

Liou, J.G., 1971. Analcime equilibria. *Lithos*, **4**, 389–402.

Liou, J.G., 1973. Synthesis and stability relations of epidote, $Ca_2Al_2FeSi_3O_{12}(OH)$. *Journal of Petrology* **14**, 381-413.

Liou, J.G., 1974. Stability relations of andradite-quartz in the system Ca-Fe-Si-O-H. *American Mineralogist* **59**, 1016-1025.

Luth, W.C., 1967. Studies in the system $KAlSiO_4$-Mg_2SiO_4-SiO_2-H_2O: Inferred phase relations and petrologic applications. *Journal of Petrology* **8**, 372-416.

Lykins, R.W. & Jenkins, D.M. 1992. Experimental determination of pargasite stability relations in the presence of orthopyroxene. *Contributions to Mineralogy and Petrology*, **112**, 405-413.

Mahar, E.M., Baker, J.M., Powell, R. Holland, T.J.B. & Howell, N., 1997. The effect of Mn on mineral stability in metapelites. *Journal of Metamorphic Geology*, **15**, 223–238.

Manghnani, M.H., 1970. Analcite-jadeite phase boundary. *Physics of the Earth and Planetary Interiors*, **3**, 456–461.

Manning, C.E. & Bohlen, S.R., 1991. The reaction titanite + kyanite = anothite + rutile and titanite-rutile barometry in eclogites. *Contributions to Mineralogy and Petrology*, **109**, 1-9.

Maresch, W.W. & Mottana, A., 1976. The pyroxmangite - rhodonite transformation for the $MnSiO_3$ composition. *Contributions to Mineralogy and Petrology* **55**, 69-79.

Massonne, H-J., & Schreyer, W., 1989. Stability field of the high pressure assemblage talc + phengite and two new phengite barometers. *European Journal of Mineralogy*, **1**, 391–410.

Massonne, H-J., 1995. Experimental and petrogenetic study of UHPM. in Ultrahigh pressure metamorphism (eds R.G. Coleman and X. Wang). 33–95. Cambridge University Press.

Massonne, H.-J., 1989. The upper thermal stability of chlorite + quartz: an experimental study in the system MgO-Al_2O_3-SiO_2-H_2O. *Journal of Metamorphic Geology*, **7**, 567-582.

Massonne, H.J., Mirwald, P.W. & Schreyer, W., 1981. Experimentelle der Reaktionskurve Chlorit + Quartz = Talk + Disthen im System MgO-Al_2O_3-SiO_2-H_2O. *Fortschritte der Mineralogie*, **59**, 122-123.

Matsui, Y. & Nishizawa, O., 1974. Iron (II)-magnesium exchange equilibrium between olivine and calcium-free pyroxene over a temperature range 800 to 1300°. *Bulletin Societé Minéralogie Cristallographie*, **97**, 122-130.

McPhail, D.C., Berman, R.G., Greenwood, H.J., 1990. Experimental and theoretical constraints on aluminium substitution in magnesium chlorite, and a thermodynamic model for H_2O in magnesium cordierite. *Canadian Mineralogist*, **28**, 859-874.

Metz, P. & Puhan, D. 1971. Korrektur zur arbeit 'Experimentelle untersuchung der metamorphose von kieselig dolomitischen sedimenten 1. Die gleichgewichtsdaten der reaktion 3 dolomit + 4 quartz + H_2O = talc + 3 calcit + 3 CO_2'. *Contributions to Mineralogy and Petrology*, **31**, 169-170.

Metz, P. 1976. Experimental investigation of the metamorphism of siliceous dolomites III. Equilibrium data for the reaction tremolite + 11 dolomite = 8 forsterite + 13 calcite + 9 CO_2 + H_2O. *Contributions to Mineralogy and Petrology*, **58**, 137-148.

Miller, Ch., 1986. Alpine high-pressure metamorphism in the Eastern Alps. *Schweitzerische Mineralogische und Petrologische Mitteilungen*, **66**, 139-144.

Moecher, D.P. & Chou, I.M., 1990. Experimental investigation of andradite and hedenbergite equilibria employing the hydrogen sensor technique, with revised estimates of $\Delta_f G^{\mathbf{o}}_{m,298}$ for andradite and hedenbergite. *American Mineralogist*, **75**, 1327–1341.

Mukhopadhyay, B. & Holdaway, M.J., 1994. Cordierite-garnet-sillimanite-quartz equilibrium: New experimental calibration in the system FeO-Al_2O_3-SiO_2-H_2O and certain P-T-X_{H2O} relations. *Contributions to Mineralogy and Petrology*, **116**, 462–472.

Myers, J. & Eugster, H.P., 1983. The system Fe-Si-O: Oxygen buffer calibration to 1500K. *Contributions to Mineralogy and Petrology* **82**, 75-90.

Newton, R.C. & Kennedy, G.C., 1963. Some equilibrium relations on the join $CaAl_2Si_2O_6$–H_2O. *Journal of Geophysical Research* **68**, 2967-2983.

Newton, R.C. & Smith, J.V. 1967. Investigation concerning the breakdown of albite at depth in the earth. *Journal of Geology*, **75**, 268-286.

Newton, R.C., 1965. The thermal stability of zoisite. *Journal of Geology*, **73**, 431-441.

Newton, R.C., 1966a. Kyanite-sillimanite equilibrium at 750°C. *Science*, **151**, 1222-1225.

Newton, R.C., 1966b. Kyanite-andalusite equilibrium from 700-800°C. *Science*, **153**, 170-171.

Newton, R.C., 1966c. Some calcite-silicate equilibrium relations. *American Journal of Science* **264**, 204-222.

Newton, R.C., 1972. An experimental determination of the high pressure stability limits of magnesian cordierite under wet and dry conditions. *Journal of Geology*, **80**, 398-420.

Nitsch, K.-H., 1972. Das P-T-XCO_2- Stabilitätsfeld von Lawsonit. *Contributions to Mineralogy and Petrology* **34**, 116-134.

Nitsch, K.-H., 1974. Neue Erkentnisse zur Stabilitat fur Lawsonit. *Fortschritte der Mineralogie,* **51**, 34-35.

Nitsch, K.-H., Storre, B., & Topfer, U., 1981. Experimentelle bestimmung der gleichgewichtsdaten die reaktion Margarit + Quartz = Anorthit + Andalusit/Disthen + H_2O. *Fortschritte der Mineralogie*, **59**, 139-140.

O'Neill, H. St.C., 1987. Free energies of formation of NiO, CoO, Ni_2SiO_4, and Co_2SiO_4. *American Mineralogist*, **72**, 280–291.

O'Neill, H. St.C., 1988. Systems Fe-O and Cu-O: thermodynamic data for the equiliria Fe-``FeO", Fe-Fe_3O_4, Fe_3O_4-Fe_2O_3, Cu-Cu_2O, and Cu_2O-CuO from emf measurements. *American Mineralogist*, **73**, 470–486.

O'Neill, H. St.C., Pownceby, M.I. & Wall, V.J., 1988. Ilmenite-rutile-iron and ulvospinel-ilmenite-iron equilibria and the thermochemistry of ilmenite ($FeTiO_3$) and ulvospinel. *Geochimica et Cosmochimica Acta*, **52**, 2065-2072.

O'Neill, H.St.C. & Wood, B.J., 1979. An experimental study of Fe-Mg partitioning between garnet and olivine and its calibration as a geothermometer. *Contributions to Mineralogy and Petrology* **70**, 59-70.

O'Neill, H.St.C., 1987. Quartz-fayalite-iron and quartz-fayalite-magnetite equilibria and the free energy of formation of fayalite (Fe_2SiO_4) and magnetite (Fe_3O_4). *American Mineralogist*, **72**, 67-75.

Olesch, M., & Seifert, F,. 1981. The restricted stability of osumilite under hydrous conditions in the system K_2O-MgO-Al_2O_3-SiO_2-H_2O. *Contributions to Mineralogy and Petrology*, **76**:362-367.

Osborn, E.F. & Shairer, J.F., 1941. The ternary system pseudowollastonite-akermanite-gehlenite. *American Journal of Science* **239**, 713–763.

Ostrovsky, I.A. 1966: PT-diagram of the system SiO_2-H_2O. *Journal of Geology*, **5**, 127–134.

Pawley, A.R. & Wood, B.J., 1995. The high pressure stability of talc and 10Å phase: potential storage sites for H_2O in subduction zones. *American Mineralogist*, **80**, 998–1003.

Pawley, A.R. & Wood, B.J., 1996. The low-pressure stability of phase A, $Mg_7Si_2O_8(OH)_6$. *Contributions to Mineralogy and Petrology*, **124**, 90–97.

Perchuk, L. L. & Lavrent'eva, I. V., 1981. Experimental investigation of exchange equilibria in the system cordierite-garnet-biotite. In Saxena, S. K., ed. Kinetics and Equilibrium in Mineral Reactions. Springer Verlag, pp. 199–240.

Perkins, D. & Vielzeuf, D., 1992. Reinvestigation of fayalite + anorthite = garnet. *Contributions to Mineralogy and Petrology*, **111**, 260–263.
Perkins, D. & Vielzeuf, D., 1992. Reinvestigation of fayalite + anorthite = garnet. *Contributions to Mineralogy and Petrology*, **111**, 260–263.
Perkins, D., III. 1983. The stability of Mg-rich garnet in the system CaO-MgO-Al_2O_3-SiO_2 at 1000-1300°C and high pressure. *American Mineralogist*, **68**, 355-364.

Perkins, D., III., Holland, T.J.B., & Newton, R.C., 1981. The Al_2O_3 contents of enstatite in equilibrium with garnet in the system $MgO-Al_2O_3-SiO_2$ at 15-40 kbar and 900°-1600°C. *Contributions to Mineralogy and Petrology*, **78**, 99-109.

Peters, T., 1971. Pyroxmangite: stability in H_2O-CO_2 mixtures at a total pressure of 2000 bars. *Contributions to Mineralogy and Petrology*, **32**, 267-273.

Peterson, J.W. & Newton, R.C., 1990. Experimental biotite-quartz melting in the KMASH-CO_2 system and the role of CO_2 in the petrogenesis of granites and related rocks. *American Mineralogist*, **75**, 1029–1042.

Philipp, R.W. & Girsperger 1990. In: Trommsdorff V. and Connolly, J.A.D. 1990. Constraints on phase diagram topology in the system $CaO-MgO-SiO_2CO_2-H_2O$. *Contributions to Mineralogy and Petrology*, **104**, 1–7.

Pownceby, M. I., Wall, V. J., & O'Neill, H. St. C., 1987. Fe-Mn partitioning between garnet and ilmenite: experimental calibration and applications. *Contributions to Mineralogy and Petrology*, **97**, 116–126.

Rao, B., & Johannes, W., 1979. Further data on the stability of staurolite + quartz. *Neues Jahrbuch für Mineralogie Monatshefte*, 437-447.

Richardson, S.W., 1968. Staurolite stability in a part of the system Fe-Al-Si-O-H. *Journal of Petrology* **9**, 467-488.

Richardson, S.W., Bell, P.M., & Gilbert, M.C. 1968. Kyanite-sillimanite equilibrium berween 700 and 1500°C. *American Journal of Science* **266**, 513-541.

Richardson, S.W., Gilbert, M.C., & Bell, P.M. 1969. Experimental determination of kyanite-andalusite and andalusite-sillimanite equilibria; the aluminium silicate triple point. *American Journal of Science* **267**, 259-272.

Robertson, E.C., Birch, A.F., & MacDonald, G.J.F., 1957. Experimental determination of jadeite stability relations between 700°C and 1500°C.*American Journal of Science* **255**, 115-137.

Robie, R.A., Hemingway, B.S. & Fisher, J.R., 1979. Thermodynamic properties of minerals and related substances at 298.15 K and 1 bar (10^5 Pascals) pressure and at higher temperatures. *United States Geological Survey Belletin*, **1452**, 456p.

Rosenberg, P.E., 1967. Subsolidus relations in the system $CaCO_3-MgCO_3-FeCO_3$ between 350 and 550°C. *American Mineralogist* **52**, 787-797.

Scarfe, C.M., Luth, W.C. & Tuttle, O.F., 1966. An experimental study bearing on the absence of leucite in plutonic rocks. *American Mineralogist* **51**, 726-735.

Schiffman, P. & Liou, J.G., 1980. Synthesis and stability relations of Mg-Al pumpellyite, $Ca_4Al_5MgSi_6O_{21}(OH)_7$. *Journal of Petrology* **21**, 441.

Schmidt, M. W., & Poli, S., 1994. The stability of lawsonite and zoisite at high pressures: Experiments in CASH to 92 kbar and implications for the presence of hydrous phases in subducted lithosphere, *Earth and Planetary Science Letters*, **124**, 105–118.

Schramke, J.A., Kerrick, D.M., & Blencoe, J.G., 1982. The experimental determination of the brucite = periclase + H2O equilibrium with a new volumetric technique. *American Mineralogist*, **67**, 269-276.

Schreyer, W., & Seifert, F., 1969. High pressure phases in the system $MgO-Al_2O_3-SiO_2-H_2O$. *American Journal of Science* **267A**, 407-443.

Schreyer, W., 1968. A reconnaissance study of the system $MgO-Al_2O_3-SiO_2-H_2O$ at pressures berween 10 and 25 kb. *Carnegie Institute of Washington Yearbook*, **66**, 380-392.

Seidel, E. & Okrusch, M., 1977. Chloritoid-bearing metapelites associated with glaucophane rocks in western Crete, Greece. *Contributions to Mineralogy and Petrology* **60**, 321-324.

Seifert, F. & Schreyer, W., 1970. Low temperature stability limit of Mg-cordierite in the range 1-7 kilobars water pressure. A redetermination. *Contributions to Mineralogy and Petrology* **27**, 25-238.

Seifert, F., 1970. Low temperature compatibility relations of cordierite in haplopelites of the system $K_2O-MgO-Al_2O_3-SiO_2-H_2O$. *Journal of Petrology* **11**, 73-101.

Seifert, F., 1973. Stability of the assemblage cordierite-corumdum in the system $MgO-Al_2O_3-SiO_2-H_2O$. *Contributions to Mineralogy and Petrology* **41**, 171-178.

Seifert, F., 1974. Stability of sapphirine: A study of the aluminous part of the system $MgO-Al_2O_3-SiO_2-H_2O$. *Journal of Geology*, **82**, 173-204.

Seifert, F., 1976. Stability of the assemblage cordierite + K feldspar + quartz. *Contributions to Mineralogy and Petrology* **57**, 179-185.

Shmulovich, K.J., 1974. Experimental study of phase equilibria in the system $CaO-Al_2O_3-SiO_2-CO_2$. (in Russian). *Geokhimiya*, 1272-1277.

Shulters, J.C. & Bohlen, S.R., 1989. The stability of hercynite–gahnite spinels in corundum- or quartz-bearing assemblages. *Journal of Petrology*, **30**, 1017–1031.

Skippen, G.B., 1971. Experimental data for reactions in siliceous marbles. *Journal of Geology*, **79**, 457-481.

Skrok, V., Grevel, K.D. & Schreyer, W., 1994. Die Stabilität von Lawsonit, $CaAl_2[Si_2O_7](OH)_2.H_2O$, bei Drücken bis zu 50 kbar. *European Journal of Mineralogy*, **6**, 270.

Slaughter, J., Kerrick, D.M., & Wall, V.J., 1975. Experimental and thermodynamic study of equilibria in the system $CaO-MgO-SiO_2-H_2O-CO_2$. *American Journal of Science* **275**, 143-162.

Smyth, F.H., & Adams, L.H., 1923. The system calcium oxide-carbon dioxide. *Journal of the American Chemical Society*, **45**., 1167-1184.

Staudigel, H., & Schreyer, W., 1977. The upper thermal stability of clinochlore at 10-35 kbar $P(H_2O)$. *Contributions to Mineralogy and Petrology* **61**, 187-198.

Storre, B. & Nitsch, K-H., 1974. Zur stabilität von Margarit im System $CaO-Al_2O_3-SiO_2-H_2O$. *Contributions to Mineralogy and Petrology* **43**, 1-24.

Taylor, B.E. & Liou, J.G., 1978. The low-temperature stability of andradite in C-O-H fluids. *American Mineralogist* **63**, 378-393.

Theye, T., Chopin, C., Grevel, K.-D. & Ockenga, E., 1997. The assemblage diaspore + quartz in metamorphic rocks: a petrological, experimental and thermodynamic study. *Journal of Metamorphic Geology*, **15**, 17–28.

Theye, T., Seidel, E. & Vidal, O., 1992. Carpholite, sudoite, and chloritoid in low-grade high-pressure metapelites from Crete and the Peloponnese, Greece. *European Journal of Mineralogy,* **4**, 487–507.

Thompson, A.B., 1970. Laumontite equilibria and the zeolite facies. *American Journal of Science,* **269**, 267–275.

Thompson, A.B., 1971. Analcite-albite equilibria at low temperatures. *American Journal of Science,* **271**, 79-92.

Velde, B., 1965. Phengite micas: synthesis, stability, and natural occurrence. *American Journal of Science* **263**, 886-913.

Vidal, O. Theye, T. & Chopin, C., 1994. Experimental study of chloritoid stability at high pressure and various fO_2 conditions. *Contributions to Mineralogy and Petrology*, **118**, 256–270.

Vidal, O., Goffé, B. & Theye, T., 1992. Experimental study of the stability of sudoite and magnesiocarpholite and calculation of a new petrogenetic grid for the system MgO-Al_2O_3-SiO_2-H_2O. *Journal of Metamorphic Geology*, **10**, 603–614.

Voigt, R. & Will, G., 1981. Das System Fe_2O_3–H_2O unter hohen Drucken. *Neues Jahrbuch fur Mineralogie Monatshefte*, 89–96.

von Seckendorff, V. & O'Neill, H.St.C., 1993. An experimental study of Fe-Mg partitioning between olivine and orthopyroxene at 1173, 1273 and 1423 K and 1.6 GPa. *Contributions to Mineralogy and Petrology,* **113**, 196–207.

Walter, L.S., 1963. Experimental studies on Bowen's decarbonation series: 1 : P-T univariant equilibria of the "monticellite" and "akermanite" reactions. *American Journal of Science* **261**, 488-500.

Walter, L.S., 1965. Experimental studies on Bowen's decarbonation series III: P-T univariant equilibrium of the reaction: spurrite + monticellite = merwinite + calcite and analysis of assemblages found at Crestmore, California. *American Journal of Science* **263**, 64-77.

Waters, D.J., 1986. Metamorphic history of dapphirine-bearing and related magnesian gneisses from Namaqualand, South Africa. *Journal of Petrology,* **27**, 541–565.

Weill, D.F., 1966. Stability relations in the Al_2O_3-SiO_2 system calculated from solubilities in the Al_2O_3-SiO_2-Na_3AlF_6 system. *Geochimica et Cosmochimica Acta,* **30**, 223–237.

Wendlandt, R.F. & Eggler, D.H., 1980. The origins of potassic magmas: 1: Melting relations in the systems $KAlSiO_4$-Mg_2SiO_4-SiO_2 and $KAlSiO_4$-MgO-SiO_2-CO_2 to 30 kilobars. *American Journal of Science* **280**, 385-420.

Windom, K.E. & Boettcher, A.L., 1976: The effect of reduced activity of anorthite on the reaction grossular + quartz = anorthite + wollastonite: a model for plagioclase in the earth's lower crust and upper mantle. *American Mineralogist,* **61**, 889-896.

Wood, B.J., 1976. The reaction phlogopite + quartz = enstatite + sanidine + H_2O. *Progress in Experimental Petrology*, 3rd NERC report, **6**, 17–19.

Wood, B.J., Hackler, R.T. & Dobson, D.P., 1994. Experimental determination of Mn-Mg mixing properties in garnet, olovine and oxide. *Contributions to Mineralogy and Petrology*, **115**, 438–448.

Wunder, B., Rubie, D.C., Ross II, C.R., Medenbach, O., Seifert, F. & Schreyer, W., 1993. Synthesis, stability and properties of $Al_2SiO_4(OH)_2$: a fully hydrated analogue of topaz. *American Mineralogist*, **78**, 285–297.

Yin, H.-A., and Greenwood, H.J., 1983. Displacement of equilibria of OH-tremolite and F-tremolite solid solution. I. Determination of the equilibrium P-T curve of OH-tremolite. *EOS*, **64**, 347.

Yoder, H.S., 1968. Akermanite and related melilite-bearing assemblages.*Carnegie Institute of Washington Yearbook,* **66**, 471-477.

Zharikov, V.A. and Shmulovich, K.I., 1969. High temperature mineral equilibria in the system CaO-SiO_2-CO_2.. *Geochemistry International,* **6**, 853-869.

Zheng, J., Li, B., Utsumi, W. & Liebermann, R.C., 1996. In situ X-ray observations of the coesite-stishovite transition: reversed phase boundary and kinetics. *Physics and Chemistry of Minerals*, **23**, 1–10.

Zhu, H., Newton, R.C. & Kleppa, O.J., 1994. Enthalpy of formation of wollastonite ($CaSiO_3$) and anorthite ($CaAl_2Si_2O_8$) by experimental phase equilibrium measurements and high-temperaturesolution calorimetry. *American Mineralogist*, **79**, 134–144.

Ziegenbein, D., & Johannes, W., 1974. Wollastonitbildung aus Quartz und calcit bei Pf = 2, 4, und 6 kb. *Fortschritte der Mineralogie,* **44**, 77-79.