TABLE 4

Temperature and gas composition data for equilibrium points determined on the univariant curves, with thermodynamic data for the reaction: 3 siderite + $\frac{1}{2}$ $O_2$ = magnetite + 3 $CO_2$ at these points

| $P_F$ (bars) | T°C (calc) | T°C (expt.) | $-\log f_{O_2}$ (bars) | $f_{CO}$ (bars) | $f_{CO_2}$ (bars) | $\log K_1(T)$ (calc) | $\Delta G°_T$ (kcal) (calc) | $\log K_1(T)$ (expt.) | $\Delta G°_T$ (kcal) (expt.) |
|---|---|---|---|---|---|---|---|---|---|
| Siderite + hematite + magnetite + gas (SHMG) | | | | | | | | | |
| 500 | 212 | 363 | 24.8 | $3.4 \times 10^{-4}$ | 535 | +26.23 | −75.7 | +20.58 ± 1.0 | −59.9 |
| 1000 | 223 | 365 | 24.7 | $8.8 \times 10^{-4}$ | 1230 | +26.42 | −75.9 | +21.62 | −63.1 |
| 2000 | 244 | 370(*) | 24.4 | $1.3 \times 10^{-3}$ | 3600 | +26.78 | −76.4 | +22.87 | −67.3 |
| Siderite + magnetite + graphite + gas (SMGrG) | | | | | | | | | |
| 500 | 234 | 455 | 25.7 | 1.3 | 570 | +25.60 | −84.7 | +21.12 ± 1.0 | −70.3 |
| 1000 | 277 | 458 | 25.2 | 2.1 | 1310 | +25.76 | −84.9 | +21.95 | −73.4 |
| 2000 | 301 | 465 | 24.2 | 3.5 | 3840 | +26.07 | −85.6 | +22.95 | −77.4 |

(*) Estimated temperature based on extrapolation from lower pressures.

can be more precisely estimated, particularly in the case of the SMGrG equilibrium (fig. 5). Accordingly, the temperatures obtained in the present study are believed to be the true equilibrium temperatures for the reactions studied.

## SIDERITE STABILITY IN $P_F$–$f_{O_2}$–T SPACE

Data for the two univariant equilibria: siderite + hematite + magnetite + gas (SHMG) and siderite + magnetite + graphite + gas (SMGrG) determined in the present study are shown in table 4. The experimentally determined temperatures are higher than those calculated from thermodynamic data (see fig. 1).

The stability field of siderite in $P_F$–$f_{O_2}$–T space can be constructed from the experimentally determined positions of the two univariant curves and is conveniently presented in an isobaric plot of log $f_{O_2}$ against T. At $P_F$ = 500 bars (fig. 8), the siderite + gas field occupies a narrow

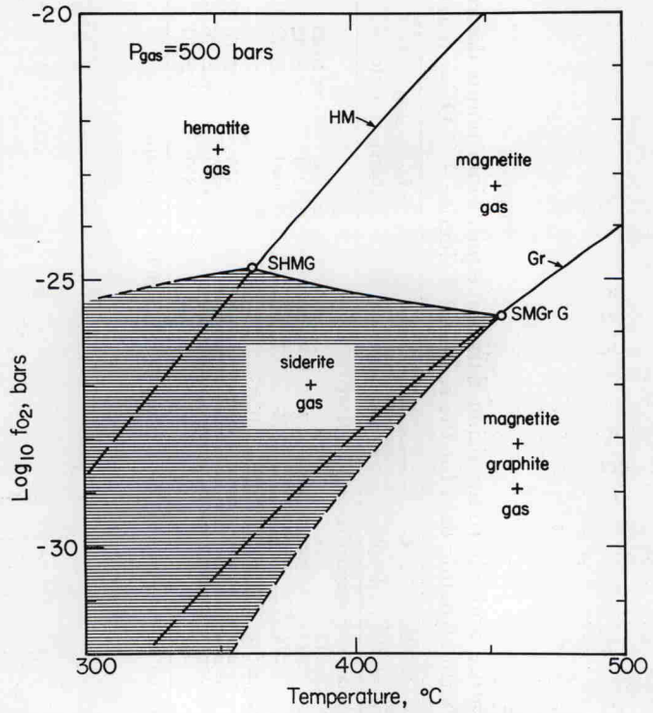


Fig. 8. Isobaric section at $P_F$ = 500 bars, showing the stability field of siderite + gas as a function of T and log $f_{O_2}$. The stability field is based on the experimentally determined isobaric invariant points; siderite + hematite + magnetite + gas (SHMG) (363°C; log $f_{O_2}$ = −24.8) and siderite + magnetite + graphite + gas (SMGrG) (455°C; log $f_{O_2}$ = −25.7). Only the part of the stability field above the graphite buffer curve (Gr) is experimentally accessible.