



System $\text{FeO-Fe}_2\text{O}_3\text{-Al}_2\text{O}_3\text{-SiO}_2\text{-H}_2\text{O}$ projected onto $\text{O-Al}_2\text{O}_3\text{-SiO}_2$ plane.

oxide mixes resulted in the crystallization of crystalline phases. At water pressure below the stability field of chloritoid, a 7 Å iron-bearing assemblage was persistent and attempts to synthesize both workers considered the chamosite assemblage but were unable to produce any conclusive evidence of chloritoid and the chamosite assemblage. It has been established that the chamosite assemblage is stable with respect to chloritoid at pressures

techniques and equipment were used in the experiments were carried out in cold seal bombs, controlled by the Ni-NiO buffer. The charge was that of Eugster and Wones (1962) and the oxide mixtures or synthetic crystalline phase pressure medium at 5.5 kbar and above,

is shown in Table 1. Identification of chloritoid by X-ray diffraction patterns of the

TABLE 1. EXPERIMENTAL DATA, COMPOSITION $\text{FeOAl}_2\text{O}_3\text{SiO}_2$ +EXCESS H_2O , ON THE SYNTHESIS OF CHLORITOID [$f(\text{O}_2)$ DEFINED BY THE Ni-NiO BUFFER]

Run	Starting material	P (kbar)	T (°C)	Time (hrs)	Products ^b
1	Ctd. qtz. her. minor cor.	8.7	675	229	Fe-anth. qtz. her. cor.
2	Oxides	8.7	650	242	Ctd. ^a
3	Oxides	8.7	625	185	Ctd. minor qtz. her. cor.
4	Oxides	8.7	600	139	Ctd. cham. qtz. her. cor.
5	Oxides	8.7	575	267	Cham. qtz. her. cor. minor ctd.
6	Cham. qtz. her. cor. minor ctd.	8.7	575	228	Ctd. minor qtz. her. cor.
7	Ctd. minor qtz. her. cor.	7	650	456	Fe-anth. qtz. her. cor.
8	Oxides	7	625	503	Ctd. minor qtz. her. cor. ^a
9	Oxides	7	600	200	Cham. qtz. her. cor.
10	Cham. qtz. her. cor.	7	600	600	Ctd. minor qtz. her. cor.
11	Oxides	5.5	600	400	Ctd. cham. qtz. her. cor. ^a
12	Ctd. cham. qtz. her. cor.	5.5	600	692	Ctd.
13	Oxides	1	525	2132	Cham. qtz. her. cor.
14	Cham. qtz. her. cor.	1	550	2489	Fe-Cord. her. qtz.
15	Fe-cord. her. qtz.	1	525	2132	Ctd. cham. qtz. her. cor. ^a

^a Highest temperature of chloritoid synthesis.

^b Abbreviations: cham—chamosite; cor—corundum; ctd—chloritoid; fe-anth—ferro-anthophyllite; Fe-cord—Fe cordierite; her—hercynite rich spinel; qtz—quartz.

reaction products. The *d*-spacings and unit cell constants for chloritoid synthesized at 8.7 kbar and 650°C and at 5.5 kbar and 600°C are listed in Table 2. The unit cell constants were refined on a triclinic cell using a least squares cell edge program written by Appleman, Handwerker and Evans (1963).

At water pressures between 8.7 and 5.5 kbar the energy barrier, which must exist between the "metastable" chamosite assemblage and the stable chloritoid was overcome by either increasing the temperature of the experiments (Runs 2, 3, 4) up to the upper temperature limit of chloritoid synthesis, or by increasing the duration of the experiments by re-running the initial products at the same temperature (Runs 5, 6, 9, 10, 11, 12). At 1 kbar water pressure and 525°C runs over 2000 hours duration failed to yield chloritoid from an oxide mix. Increasing the temperature from 525°C to 550°C (Runs 13, 14) was equally unsuccessful in producing chloritoid due to the appearance of the high temperature breakdown products iron cordierite, hercynite and quartz. The hercynite