



Fig. 3. Phase relations in the system $\text{MgO}-\text{Al}_2\text{O}_3-\text{SiO}_2-\text{H}_2\text{O}$ at high temperatures and water pressures up to 5 kb, shown as a projection onto the water-free base plane of the system. Abbreviations: *Q* quartz, *E_{ss}* orthoenstatite solid solution, *Fo* forsterite, *P* periclase, *Sp* spinel, *C* corundum, *Sill* sillimanite, *Sa* sapphirine, *Co* cordierite. Miscibilities and polymorphic transitions have been neglected, only the enstatite solid solubility is indicated schematically. Breakdown of sillimanite into mullite + SiO_2 at low pressures and high temperatures and incoming of sapphirine-mullite assemblages beyond 1280°C , 1 atm is ignored. Data are from Fawcett and Yoder (1966), Schreyer and Schairer (1961) and unpublished work of Seifert. The curve "Beginning of melting" shows the solidus of the assemblage coexisting with the most aluminous enstatite

as the only phase, or part of the excess alumina assemblage, i. e. cordierite + forsterite, cordierite + spinel, or cordierite + sapphirine, was left over. On the other hand, the homogeneous alumina-rich orthoenstatite solid solutions used as starting materials unmixed to less aluminous orthoenstatites plus e. g. cordierite and spinel, whereas less alumina-rich orthoenstatites remained unaffected. Equilibrium was obviously attained when the two sets of starting materials exhibited the same solid solubility of orthoenstatite after the run. Except in some initial rather short experiments which were discarded later no hysteresis interval could be found.

The extent of the miscibility was determined both from phase relations and X-ray properties (see below). Gels were only used for exploratory runs but yielded essentially the same results, probably due to the rather long duration of runs.

Experimental Results

The results of the experiments at high temperatures and pressures are compiled in Figs. 4a-c in the form of isobaric T_x -sections of part of the pseudobinary system $\text{MgSiO}_3-\text{Al}_2\text{O}_3$; critical runs of the some 160 experiments made are listed