Phase Relations and Equations of State for High-Pressure Phases of Ferrosilite and Enstatite	X17B1

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In two separate experiments, we have begun studying the high pressure phase of $FeSiO_3$ known as ferrosilite III, and the ilmenite phase of $(Mg_{.9}Fe_{.1})SiO_3$.

As can be seen in the figure below, the Ilmenite phase of $(Mg_{.9}Fe_{.1})SiO_3$ occurs at high pressure, just below that of the perovskite phase. We lost the thermocouple during the experiment, so we were unable to get a good EOS. The EOS measurements were done outside the ilmenite stability field (using power to estimate temperature), and we were concerned that the ilmenite sample would convert to a lower pressure phase when heated. This, in fact, did not occur, so in future experiments we should be able to go to higher temperature.

Ferrosilite III is known only as a phase quenched from high temperature ($\sim$1200C) and modestly high pressure (2-3 GPa). The quench phase is a 9-repeat pyroxenoid polymorph of ferrosilite, with the formula $FeSiO_3$. The purpose of the experiment is to determine if the quench phase is also the stable phase under the conditions at which it was formed. Due to experimental difficulties, the answer is still not known.

In the first run, we started with the quench phase and increased pressure at room temperature to about 3 GPa, then heated. We had to heat fast, because we didn't want the sample to transform to orthoferrosilite, which is the stable phase at this pressure and lower temperatures. Unfortunately, we overshot the Fs-III field, and melted the sample. In a second attempt, the thermocouple failed and temperature had to be estimated based on heater power. The sample at the final data point had transformed to orthoferrosilite, so we must have been slightly low in temperature.

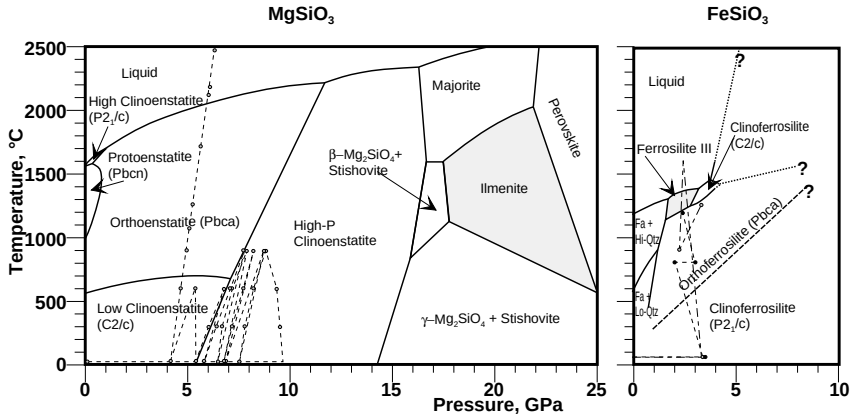

Figure 1. Phase relations in $MgSiO_3$ and $FeSiO_3$.