Phase Relation of $(Mg,Fe)_2SiO_4$ at High Pressure and Temperature∗	X17B1

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$(Mg,Fe)_2SiO_4$ olivine is probably the most abundant mineral in the Earth's upper mantle. Transformations of this mineral from olivine (α phase) to high-pressure phases, modified spinel (β phase) and ringwoodite (spinel, γ phase), have been implicated as the main source of seismic discontinuities at the upper mantle-transition zone boundary and within the transition zone. The α-β-γ phase relations have been continuously studied [1-6] by quench experiments. Partitioning between Mg and Fe in the sample makes the phase relation complicated (Figure 1). The only z *in-situ* x-ray diffraction experiment had been done on the end member Mg2SiO4 (forsterite)[7].

At the X17B1 beamline, we have carried out *in-situ* x-ray diffraction experiments to study the phase relation in $(Mg,Fe)_2SiO_4$ using multi-anvil press SAM85. T-cup high-pressure vessel was used to generate the pressure up to 20 GPa. Samples with composition of $(Mg_{0.9},Fe_{0.1})_2SiO_4$, $(Mg_{0.8},Fe_{0.2})_2SiO_4$ and $(Mg_{0.75},Fe_{0.25})_2SiO_4$ have studied. These experiments have focused on the univariant phase boundary, which is characterized by β phase presenting and β phase absenting as shown by bold line in Figure 1. Preliminary data analyses indicate that our *in-situ* experimental result slightly differs from those by quench technique. The study will continue at the beamline. ∗Work was supported by the NSF under a grant EAR 89-20239 to the Center for High Pressure Research, and by the DOE contract No. DE-AC02-98CH10886 to the NSLS.

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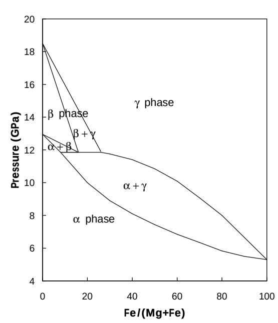

Figure 1. Compositional phase diagram for $(Mg,Fe)_2SiO_4$.