In situ determination of the olivine-modified spinel phase boundary in the system Mg2SiO4-Fe2SiO4

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We studied the phase relations of olivine-modified spinel transition in the system Mg2SiO4-Fe2SiO4 by X-ray diffractometry at 1600 and 1900K. Pressures were determined from the unit cell volume of MgO pressure maker and temperature using EOS of MgO proposed by Jamieson et al.,(1982). Compositions of coexiting phases in the recovered samples were determined using electron microprobe analyzer. The phase relations thus obtained suggest that the temperature at the 410km depth is estimated to be 1850K and the depth interval of olivine-modified spinel coexiting regions in the mantle is 20km, if the composition of mantle olivine is Fo89. The seismic observations showing less than 10km thickness of the 410km discontinuity can not be simply explained by applying the phase diagram of this study.

We studied the phase relations of olivine-modified spinel transition in the system Mg2SiO4-Fe2SiO4 by means of X-ray diffractometry at 1600 and 1900K. Starting materials were olivine solid solutions with compositions of (MgxFe1-x)2SiO4(x=0.97-0.70). High P-T experiments were conducted using a 6-8type multianvil press "SPEED-1500" at SPring-8. Pressures were determined from the unit cell volume of MgO pressure maker and temperature using EOS of MgO proposed by Jamieson et al.,(1982). Compositions of coexiting olivine and modified spinel in the recovered samples were determined using electron microprobe analyzer. The phase relations thus obtained suggest that the temperature at the 410km depth is estimated to be 1850K and the depth interval of olivine-modified spinel coexiting regions in the mantle is 20km if the composition of mantle olivine is (Mg0.89Fe0.11)2SiO4. The seismic observations showing less than 10km thickness of the 410km discontinuity can not be simply explained by applying the phase diagram of olivine-modified spinel transition.