Stability of hydrous magnesium silicate at lower mantle conditions

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Water could be carried down into the Earth's interior through subducting slabs by hydrous minerals. The water released by dehydration of subducting slabs has been considered to be a partial melting and plays an important role in mantle dynamics. Shieh et al. (1998) suggested that phase D(G) (ideal formula: MgSi2H2O6) which is transported further into the lower mantle decomposes as the pressure increases.

We have studied the stability of phase D(G) by X-ray diffraction experiments at high pressure and high temperature up to 60 GPa, 1273 K using a diamond anvil cell with Nd:YAG laser heating system. Pressure was determined by the ruby fluorescence method and temperature was measured by radiation from the heating sample. The mixture of natural orthopyroxene powder with a composition of (Mg0.84, Fe0.16)SiO3 and water were used as starting materials.

At 30 GPa, under 1273 K, phase D(G) + stishovite + brucite were observed in the assemblage. Phase D(G) was observed at 42 GPa, 1273 K and stishovite + perovskite + unknown phase were observed at 45 GPa, 1273 K. This result was generally consistent with that of Shieh et al. (1998). However, we observed some unknown peaks in this run. This suggests that new hydorous or unhydrous phases might exist at this condition.