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: $MgSi_2H_2O_6$) which is transported futher 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 60GPa, 1273K 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 $(Mg_{0.84},Fe_{0.16})SiO_3$ and water were used as starting materials.

At 30 GPa, under 1273K, phase D(G) + stishovite + brucite were observed in the assemblage. Phase D(G) was observed at 42GPa, 1273K and stishovite + perovskite + unknown phase were observed at 45GPa, 1273K. 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.