

In-situ observation of dehydration and incongruent dissolution of antigorite into aqueous fluids

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It is considered that dehydration of serpentine in slab or mantle wedge causes seismicity (Yamasaki and Seno(2003 J. Geophys. Res.)). We performed an in situ observation of serpentine dehydration using Basset-type externally heated diamond anvil cell (W.A.Bassett et al. 1993 Rev. Sci. Instrum.).

We placed antigorite($Mg_{48}Si_{34}O_{85}(OH)_{62}$) in water along with an air bubble in the cell. Before the heating, we confirmed there was no forsterite in the cell by Raman spectroscopic investigation. With Raman spectrum data of antigorite, we compared with Enami(2006 Gansekikoubutsukagagu in Japanese). On the heating, we observed, when antigorite dehydrate in water, antigorite melted in water and then forsterite formed and separated from water at 550-600 C and 0.2-0.7 GPa. The forsterite grew to about 30micrometer size in an hour.

The stability of antigorite suspected from this experiment isn't in contradiction Evans et al. (1976 Schweiz. Mineral. Petrogr. Mitt.).

Takahashi et al. (2011 J. Geophys. Res.) suggests dehydration of antigorite causes strengthening and embrittlement of the gouge by shear-sliding test. We got the result of supporting this suggestion. We didn't observe talc after the heating, so we considered that talc melted in water.

Keywords: antigorite, dehydration, in situ observation, high temperature and high pressure, seismicity, incongruent dissolution