

Garnet pseudomorph as indicator of the extent of a rehydration reaction

Tatsu Kuwatani[1]; mitsuhiro toriumi[2]

[1] Earth and Planetary Sci., Univ. Tokyo; [2] Univ.Tokyo

Regional metamorphic belts usually underwent pervasive retrogressive rehydration metamorphism (e.g. Ota et al. 2004; Okamoto and Toriumi 2005 etc. in the Sambagawa metamorphic belt). Rehydration metamorphism may be a key to understand fluid behaviors and exhuming processes of a metamorphic belt in a subduction zone. Our previous works investigated the effect of P-T change and external water supply on the progress of rehydration reactions by thermodynamic forward calibrations (Kuwatani et al. 2006 AGU Fall-Meeting). However, the nature of spatial and temporal variations of the progress of rehydration reactions in natural system is still little understood, because hydration proceeds very heterogeneously on various scales (from a sub-grain scale to a metamorphic-belt scale), depending on various environmental factors (e.g. geological settings, lithology, deformation structures). A quantitative tool which can evaluate the progress of hydration reactions from natural samples is requisite for such researches.

We focused on mineral-replacing structures (i.e. pseudomorphs) which are common in retrograde metamorphic rocks. Partial pseudomorph is the most reliable evidence of a reaction, since the replaced mineral and the solid products can be directly observed. The new methodology based on a simple mass-balance relation was developed by improving Gresens 1967 and Godard & Mabit 1998. This method can determine the stoichiometric relation of the reaction, the reaction progress and the material transfer including H₂O at the same time from the EPMA compositional images of a partially-pseudomorphed mineral.

In this presentation, we will share some results of the applications for garnet pseudomorphs in the Iratsu eclogite mass.