

# Devolatilization by metasomatism between serpentinite and metapelite: an example from the Nishisonogi metamorphic rocks, Japan

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Recently, several authors have proposed devolatilization caused by rock-mixing in metamorphism (e.g., Kunugiza et al., 1994; Goto et al., 1994; Enami et al., 1997). Such a process is particularly important in serpentinite melanges. This study deals with the devolatilization caused by metasomatism between serpentinite and metapelite as an analog of rock-mixing in serpentinite melanges.

The rocks studied here are of the Nishisonogi metamorphic rocks, Kyushu, Japan. The metamorphic rocks consist mainly of pelitic schist, basic schist and serpentinite. They belong to the epidote-blueschist subfacies of metamorphism. The contacts between the serpentinite and pelitic schist are marked by reaction zones. The reaction zones are typically several meters thick. Many magnesite + quartz and dolomite veins emanate from the reaction zone to the serpentinite and the pelitic schist, respectively. There is no vein penetrating the reaction zone. The veins are generally filled by euhedral or subhedral grains. The magnesite + quartz veins sometimes have inclusion bands of serpentine parallel to the vein-wall. These crack-seal textures suggest that the veins were produced by repeated hydraulic fracturing.

In order to demonstrate simultaneous formation of the reaction zones and veins, homogenization temperatures for fluid inclusions were examined. The homogenization temperatures for primary inclusions have a peak at 140-145 C in both the reaction zone and associated magnesite + quartz veins. The agreement of the homogenization temperatures suggest that the reaction zones and veins were formed in the same P-T conditions. The P-T conditions were estimated to be 0.4 GPa and 350 C on the basis of the homogenization temperatures and the dolomite-calcite geothermometry.

Chemical mass balance between the reaction zone and its protoliths were calculated. The isocon method (Grant, 1986; Baumgartner & Olsen, 1995) was used for the calculation. The result indicates that the reaction zone is depleted in several components such as SiO<sub>2</sub>, K<sub>2</sub>O and H<sub>2</sub>O. These components were probably released as fluid from the reaction zone during metasomatism.