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New experimental data on the antigorite dehydration in silica enriched serpentinite

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There is a growing body of evidences for complex interaction between highly reactive fluids and ultramafic lithologies. Silica metasomatism, for example, can occur at the basement of slow-spreading mid-ocean ridges and during prograde metamorphism of chaotically intermixing in mélange zones of ultramafic rocks, metasediments and metabasites in subduction settings. The resulting assemblage diagnostic of metaperidotites that experienced silica metasomatism are talc-schist and talc-bearing serpentinite. These lithologies may hence be common in subduction settings and will undergo different dehydration reactions. Antigorite and talc will react at lower temperature than the terminal antigorite dehydration. Although this reaction is not expected to be as important in the transfer of water to mantle depth as the breakdown of antigorite, it represents nevertheless a dehydration event in subduction zones that has not been considered so far. We anticipate that this reaction might be particularly important for the fore-arc mantle wedge.

Piston cylinder experiments were performed to constrain the pressure and temperature conditions for two high-pressure antigorite dehydration reactions found in silica-enriched serpentinites from Cerro del Almirez (Nevado–Filábride Complex, Betic Cordillera, southern Spain) [1]. At 630–660ºC and pressures greater than 1.6 GPa, antigorite first reacts with talc to form orthopyroxene $\pm$ chlorite + fluid. We show that orthopyroxene + antigorite is restricted to high-pressure metamorphism of silica-enriched serpentinite. This uncommon assemblage is helpful in constraining metamorphic conditions in cold subduction environments, where antigorite serpentinites have no diagnostic assemblages over a large range in PT space [2,3]. The second dehydration reaction leads to the breakdown of antigorite to olivine + orthopyroxene + chlorite + fluid. The maximum stability of antigorite is found at 680ºC at 1.9 GPa, which also corresponds to the maximum pressure limit for tremolite coexisting with olivine + orthopyroxene [4].

[1] Trommsdorff, López Sánchez-Vizcaíno, Gómez-Pugnaire, and Müntener (1998), *Contrib Mineral Petr* **132** 139-148.

[2] Hermann, Müntener, and Scambelluri, (2000) *Tectonophysics* **327**, 225-238.

[3] Scambelluri, Müntener, Hermann, Piccardo, and Trommsdorff, *Geology* **23**, 459-462.

[4] Padrón-Navarta, Hermann, Garrido, López Sánchez-Vizcaíno, and Gómez-Pugnaire (2010), *Contrib Mineral Petr* **159**, 25-42.