Antigorite dehydration fluid-mineral element distribution

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Antigorite dehydration is arguably the most important water release reaction deep in subducted slabs, triggering fluid-mediated element transfer within and out of the slab into the mantle wedge where flux melting produces arc magmatism. However, compositional antigorite dehydration fluid data are scarce in the literature. An antigorite dehydration front is preserved in the field at Almirez, Spain [1], for which we present LA-ICP-MS data for olivine-hosted fluid inclusion relics, olivine, orthopyroxene, and chlorite and deduce fluid-mineral element distribution coefficients. To quantify fluid inclusion element concentrations, a salinity of 0.4 wt% $NaCl_{equivalent}$ was employed [2].

Inclusions are rich in Na-K-Ca-B-U-As-Sb-Pb-Bi-Cs-Rb-Ba-Sr-S-Cl-Br at concentrations largely exceeding primitive mantle (As ≦100 PM, Sb ≦300 PM, Bi ≦20 PM, Cl ≦130 PM, Br ≦230 PM). PM-normalised fluid element patterns are closely comparable with those obtained on similar inclusions from Cima di Gagnone [3]. $KD_{fluid/mineral}$ are >1 for all coexisting prograde minerals; however, they cluster around 1 for B and Li. Element $KD_{fluid/rock}$ data derived from petrographically determined modal mineral abundances refined based on major element rock and mineral data confirm this picture, suggesting that the 4 prograde phases control the fluid mobile element (FME) behaviour. The average molar Br/Cl ratio of 19 polyphase inclusions is $9.8 \pm 3.2 * 10^{-4}$ 1SD, identical to $10 \pm 2 * 10^{-4}$ 2σ of Kendrick et al. [4] released from olivine-enstatite separates by crushing and measured by the noble gas method. Such a Br/Cl signature indicates sediment-equilibrated fluids involvement during serpentinisation in forearc settings, consistent with FME characteristics. Importantly, B, As, Sb, Bi, ±U (and Li for olivine) occur in the product silicates at concentrations exceeding PM values (despite their preferred partitioning into the dehydration fluid), implying their potential to modify the composition of the convecting mantle.

[1] Trommsdorff *et al.* (1998), *CMP* **132**, 139-148. [2] Scambelluri *et al.* (2004), *EPSL* **222**, 217-234. [3] Scambelluri *et al.* (2015), *EPSL* **429**, 45-59. [4] Kendrick *et al.* (2011), *Nat.Geosci.* **4**, 807-812