

# Unravelling the behaviour of chalcophile trace elements in magmatic systems of the oceanic crust

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The behaviour of chalcophile elements in magmatic systems is strongly controlled by magmatic sulphide droplets (consisting of mss and iss) [1-2], which are remnants of former immiscible sulphide liquids. We are investigating the source of chalcophile trace elements and their behaviour during fractionation in magmatic systems of the oceanic crust. For this purpose, we performed in-situ LA-ICP-MS analysis of sulphide droplets hosted by various igneous rocks (peridotites, gabbros and volcanic rocks) from different sections of the oceanic lithosphere and different tectonic settings. Sulphide droplets in volcanic rocks from intra-oceanic arcs are generally low in Ni (<1000 µg/g) and show lower Ni/Cu (<0.13) relative to those from mid-ocean ridges. This documents the later sulphide saturation in oxidised arc magmas, where most of the Ni is incorporated in early crystallizing olivine [3-4]. The Ni content of gabbros from the East Pacific Rise (EPR) is highly variable (~10 µg/g to >10000 µg/g) and spans the entire range of the lava samples. We assume that the magmatic system of the EPR reached early sulphide saturation, as commonly observed at mid-ocean ridges, resulting in high Ni contents. Subsequently, the magma either remained sulphide saturated for a longer period of time or experienced a multistage saturation during ascent through the crust. Sulphide droplets in gabbros from the Southwest Indian Ridge, Mid-Atlantic Ridge and Raoul Island (Kermadec arc), but also in peridotites from the Kermadec Trench, show less heterogeneous and high Ni contents (mostly >1000 µg/g). However, they display a larger variation in Ni/Cu (~0.001 to >1000) caused by highly variable Cu contents. Our preliminary results indicate that the Cu contents, and likely those of other chalcophile elements (e.g., Co, Ag, Au, and PGE's) in magmatic sulphide droplets, change with magma differentiation and ascent or are influenced by compositional differences in the primary mantle melts between tectonic settings.

[1] Wood, B. J. and Kiseeva, E. S. (2015), *Earth and Planetary Science Letters*, 424, 280-294. [2] Patten, C. et al. (2013), *Chemical Geology*, 358, 170-188. [3] Keith, M. et al. (2017), *Chemical Geology*, 451, 67-77. [4] Jenner, F. E. et al. (2010), *Journal of Petrology*, 51, 2445-2464.

