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Behavior of chalcophile elements in back-arc magmas : new insights from Futuna area (SW Pacific)

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Oxidized magmas of back-arc geological setting might produce mineralizations enriched in Cu, Ag and Au compared to there MORB equivalent. These highly siderophile (HSE) and strongly chalcophiles elements (SCE) are mobilized from a magmatic source and enriched in the lavas in sub-surface following the main chemical events involving sulfur. These enrichements related to magmatic processes may be recorded in massive sulfides on the seafloor. However, processes leading to these enrichements are not well established. In particular, the role of (i) initial melt composition and (ii) magma chamber processes (e.g. the point at which the silicate melt becomes saturated with a sulfide phase (Jenner et al., 2010)) needs further studies.
In 2012, numerous massive sulfide deposits with high Au and Ag concentration were discovered in the French EEZ of Wallis and Futuna at the western end of the north Lau back-arc basin. These mineralizations are located in a broad diffusive magmatic zone that results from the partial melting of an Indian-like mantle variously metasomatized by an enriched, hotspot-like, end-member (e.g. Samoan plume ; Labanieh et al., 2011). Here we present new major and trace element data for submarine volcanic glasses with a specific focus on HSE and SCE. Magmatic rocks including basalts, basalt andesites, dacites and rhyolites (MgO : 0.4 – 12 wt.%) have been selected and analyzed with EPMA and LA-ICP-MS. These new data bring constraints on the role of the magmatic processes governing the behavior of these elements before their deposition in hydrothermal mineralizations in slab-decoupled back-arc.

Jenner, F. E., O'Neill, H. S. C., Arculus, R. J. & Mavrogenes, J. A. (2010). The magnetite crisis in the evolution of arc-related magmas and the initial concentration of Au, Ag and Cu. Journal of Petrology 51, 2445–2464.
Labanieh, S, Chazot G, Etoubleau J, Fouquet, Y, Dosso, L, Hemond, C (2011). Origin of the seamounts near Futuna island, SW Pacific. Goldschmidt Conference Abstracts 21, Prague, Czech Republic, 1261.