

An isotopic investigation of supergene weathering process in gossans from the Troodos ophiolite, Cyprus.

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The Troodos ophiolite is a fragment of Mesozoic oceanic crust, which uplifted during Alpine orogeny and belongs to supra-subduction zone [1]. It hosts significant Volcanogenic Massive Sulfide (VMS) systems, well-known as Cyprus-type sulfide deposits [2]. They are mafic type VMS deposits, mainly enriched in copper and zinc, with average grade of $1.3 \pm 1.1\%$ Cu and $0.8 \pm 0.4\%$ Zn [3] and deposited from seawater derived-hydrothermal fluids [1]. Along the Troodos ophiolite, the VMS system is covered by thick, Fe- rich altered caps, known as gossans. The latter are likely due to weathering of the VMS under oxidizing conditions [4]. However, the conditions for their formation remain largely debated. They can result from submarine weathering but also be due to mineralization weathering on land. Gossans form a variety of deposits from ochers to Fe-oxide sediments, like goethite-limonite, to jarosite-rich deposits [3]. Gossans also continue a very interesting part of the Troodos ophiolitic sequence from an economic point of view, as they present not only significant amount of extractible copper and zinc, but also, gold and silver [4]. The studied gossans from the Troodos ophiolite present as mineral assemblage: goethite, jarosite, hematite, alunite, silica, clays, anatase and siderite. As accessory phases, they contain magnetite, ilmenite and gypsum. In this study we present combined data of Cu, Zn and Fe isotopes from three different mines of the Troodos ophiolite (West Apliki, Skouriotissa and Agrokipia). They present $\delta^{65}\text{Cu}$ values varying from -3.55‰ to -0.05‰ and $\delta^{66}\text{Zn}$ values ranging from -1.24‰ to $+0.34\text{‰}$. Moreover, $\delta^{56}\text{Fe}$ values vary from -0.65‰ to $+0.80\text{‰}$. Based on the redox-sensitive behavior of Cu and Fe, as well as the pH-sensitive behavior of Zn in supergene-weathering environments, we aim to determine the debated origin of the Troodos ophiolite gossans influenced by fluids nature, physicochemical conditions and primary mineralization (e.g. pyrites) and investigate the supergene weathering process in VMS systems.

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[3] Hannington et al. (1998). *Chapter 28*, 158, 389–415.

[4] Herzog et al., (1991). *Economic Geology*, 86(8), 1747-1755.