Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.6137

METALLOGENIC FINGERPRINT OF A FERTILE MANTLE SOURCE UNDERLYING AN ORE-PRODUCTIVE VOLCANIC PROVINCE

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Peridotite xenoliths hosted in alkali basalts from Tallante (SE Spain) provide a unique insight into the geochemical evolution of a transitional lithospheric domain between the paleo-southern Iberian margin and the westward migrating Alborán micro-continent in the westernmost Mediterranean. Fertile spinel lherzolites xenoliths sample a subcontinental lithospheric mantle that underwent pervasive crystallization of metasomatic sulfide-bearing pyroxenes. Mantle refertilization occurred in response to the percolation of subalkaline silicate melts released upon asthenosphere upwelling and slab tearing of the Iberian continental lithosphere during the Miocene. In the Pliocene, the influx of heat/volatiles from host-alkali magmas triggered small-scale partial melting of metasomatic sulfide-bearing assemblages, producing melt now quenched to silicate glass and spongy coronae around clinopyroxene and spinel.

Refertilization of Tallante peridotites caused the precipitation of pyroxenes-hosted base-metal sulfides (BMS) with anomalously high Au concentrations. These sulfides are everywhere pentlandite ± chalcopyrite ± bornite aggregates with homogeneous compositions in terms of major elements (Ni, Fe, Cu) and semi-metals (Se, As, Te, Sb, Bi), consistent with precipitation from a Ni-Cu rich sulfide melt produced by incongruent melting of monosulfide solid solution. However, BMS show strongly heterogeneous PGE systematics characterized by a variety of PGE-chondritic normalized patterns (i.e., positive, flat and negative slope), which cannot be explained by conventional partitioning of PGE in sulfide systems. Moreover, the presence of euhedral Pt-(Pd)-Sn rich platinum-group minerals (PGM) and Au particles points out that the distribution of noble metals in Tallante BMS was controlled by the incorporation of distinct populations of nano- to micron-sized PGM and/or metal particles during mantle melting and/or melt percolation. We conclude that metasomatic precipitation of sulfide-hosting pyroxenes provided an efficient mechanism for storing metals, especially gold, in the SCLM underlying the ore-productive volcanic province of southeast Spain.