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PGE mineralization in transition zone dunites from the Spongtang Ophiolite, Ladakh, NW Himalaya

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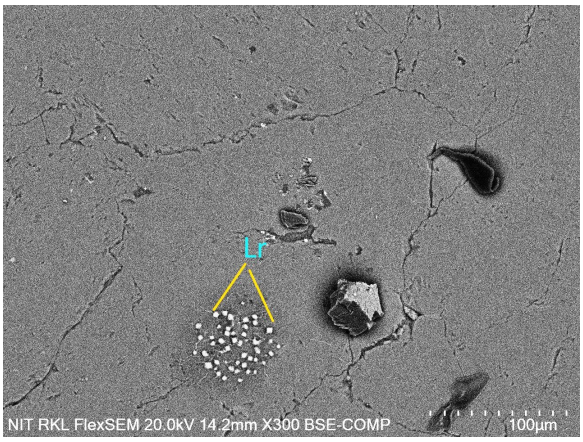

The transition zone dunites from the Spongtang ophiolite host valuable platinum group minerals (PGM), base metal sulfides (BMS) and chromitites. The primary mineralogy of these rocks is still intact since it has suffered less alteration. They consist of interlocking phenocrysts of olivines (10-20 mm) with accessory orthopyroxenes (10-15 mm), clinopyroxenes (5-10 mm) and chromites (3.5-7 mm) manifesting cumulate texture. In some samples, nodular olivine grains are observed, which appear to be highly crushed. Such nodular olivine grains are an inherent character of mantle peridotites that has suffered crystal plastic deformation. Deformation fabric such as kink banding and undulose extinction in olivines and pyroxenes is documented. Chromite grains are found to be either disseminated within these dunitic rocks or as bands of varied sizes (0.5-6 cm) crosscutting the rock. Olivine with chromite cumulate band has also been observed within harzburgite . The abundances of PGEs are mainly controlled by the source rock, extent of melting, sulfide saturation and crystal fractionation. Platinum group minerals (PGM) such as laurite, Pt-Fe alloy, Pt-Au alloy and some base metal sulfides (BMS) have been detected in these dunites. Here, laurites and few base metal sulfides occur as discrete grains within unaltered chromites and olivines implying its primary magmatic origin while, Pt-Fe alloys had nestled within/or adjacent to the fractures indicating remobilization of Pt by circulating hydrothermal fluids. The presence of laurite implies its crystallization at high temperature (~1200°C) and low fS_2 condition (Sideridis et al. 2021). The higher concentration of PPGE compared to IPGE could suggest the economic potentiality of the south Ladakh ophiolites. The low sulfur content of PGMs within the oxide phases may infer a sulfur-undersaturated magma at the early stage of crystallization. This study therefore, unravels the magmatic processes at crust-mantle boundary and evolution of the Neotethyan oceanic lithosphere.

References:

Sideridis A, Zaccarini F, Koutsovitis P, Grammatikopoulos T, Tsikouras B, Garuti G, Hatzipanagiotou K (2021), Chromitites from the Vavdos ophiolite (Chalkidiki, Greece): Petrogenesis and geotectonic settings; constrains from spinel, olivine composition, PGE mineralogy and geochemistry. Ore geology reviews 137, 104289.