A secondary (PGE-Au) ± Ni-S-As-Sb-Pb mineralization in serpentinite shear zones from Central Chile

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The ultramafic rocks hosted in the Paleozoic Coastal Accretionary Complex of Central Chile host small meter-size pods of chromite ores within in shear zones filled by schistose antigorite (±talc) that isolate blocks of non-deformed olivine-lizardite dunites. The chromite ores appreciable amounts of the platinum-group elements (up to 347 ppb total) and gold (up to 24 ppb), which has its expression in the mineralogy by the presence of specific phases of the six platinum-group elements (i.e., platinum-group minerals, PGM) as well as native gold. The PGM identified include native osmium, laurite (RuS_2), irarsite (IrAsS), osarsite (OsAsS), omeiite ($OsAs_2$), Pt-Fe alloy (possibly isoferroplatinum) and a suite of inadequately identified phases such as PtSb (possibly stumpflite), PdHg (possibly potarite), RhS, Ir-Ni and Ir-Ni-Ru compounds. Only a few grains of osmium and laurite were identified in unaltered cores of chromite and therefore considered as magmatic formed during the high-T event of crystallization of the chromitite in the upper mantle. The other PGM were located in porous chromite associated with chlorite or the base-metal minerals (BMM) that often fill the pores of this secondary chromite or are intergrowth with antigorite in the host serpentinized ultramafic rock. The assemblage of BMM identified in the studied rocks include sulphides [millerite (NiS), polydymite (Ni_3S_4), violarite ($FeNi_2S_4$), galena (PbS), sphalerite (ZnS), chalcocite (CuS)], arsenides [(nickeline (NiAs), orcelite ($Ni_{5-x}As_2$), maucherite ($Ni_{11}As_8$)], the sulpharsenides gersdorfitte (NiAsS), and native bismuth. We suggest the origin of these PGE-Au) ± Ni-S-As-Sb-Pb minerals as a result of the reaction of magmatic PGMs with fluids rich in metalloids such as As, Sb, Pb, Zn and Hg emanated from the country metasediments that have penetrated the ultramafic rocks through active shear zones. This secondary mineralization took place coevally with the formation of prograde antigorite within the shear zones once the ultramafic bodies became tectonically mixed with the host metasediments. During this a secondary gold mineralization was produced in the studied rocks.