Ophiolitic chromite geochemistry: Implication on chromite formation in various mantle environment

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Two ophiolite complexes in the Philippines were studied in terms of its geochemistry, morphology, and geochronology – the Dinagat Ophiolite Complex (DOC) along the "mobile belt" in the east and the Palawan Ophiolite Complex (POC) in the "immobile belt" in the west.

Consideration of major oxide chemistry reveals that in POC the schlieren or layered type manifests aluminian composition (Cr# = 0.38 to 0.62) whereas the podiform variety possesses chromian composition (Cr# = 0.72 to 0.88). Schlieren chromite also shows relatively high occurrences of solid inclusions within chromite grains and is composed mainly of hydrous silicates and pyroxenes and discrete grains of sulfides and alloys of nickel and the platinum group of minerals. In DOC the chromite though layered is dominantly chromian (Cr# = 0.68 to 0.86). Reports of leopard-type chromite ores imply presence of podiform chromite bodies in the vicinity. Meanwhile chromite ore geochemical trend implies a process distinct or even contrary to accessory chromite which is a continuous depletion of Al_2O_3 but gain in Cr_2O_3 as partial melting progresses. Chromite generally has elevated REE contents compared to the harzburgite-dunite host implying that chromite may not have been formed through multiple melting events which may deplete REEs in the system.

Using the Re-Os isotope systematic further elucidate a process conforming with the major oxide and REEs signature of chromite with respect to host harzburgite. The $^{187}Os/^{188}Os$ ratios of aluminian chromite of POC yield supra-chondritic values which imply introduction of Os in the system most probably through a subduction event which might have occurred some 50 Ma ago. Chromian-rich ores meanwhile manifest sub-chondritic values (0.1197 to 0.1239 for DOC; 0.1237 to 0.1245 for POC) implying formation in depleted environment some 250 Ma and 600 Ma respectively.