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A chromian spinel-oversaturated melt for podiform chromitite formation: Evidence from well-preserved dunite clots in massive podiform chromitites in the Coto Block, Zambales Ophiolite Complex, Philippines

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Oval-shaped dunite clots occur within massive podiform chromitites in the Coto Block of the Zambales Ophiolite Complex, Philippines. The size of the well-preserved dunite clots ranges from 3-4 cm in length and 1.5-2 cm in width. These dunite clots are composed mainly of olivine, spinel and very minor amounts of serpentine. Olivines are mostly subhedral and coarse-grained reaching up to 3 mm across. Compared to the spinels in the massive podiform chromitites, the dark brown spinels in dunite are anhedral to subhedral and are generally smaller (<0.5 mm). The massive podiform chromitites hosting the dunite clots are primarily composed of spinel (95%) with olivine, plagioclase, serpentine and chlorite as the interstitial silicate matrix (5%). The reddish brown spinels are subhedral to euhedral and are coarse-grained reaching up to 5 mm across. The contact between the massive podiform chromitites and the dunite is very ragged and irregular. Near the contact, rounded to lobate olivine grains (<0.5 mm in diameter) occur as inclusions within the spinels in the massive podiform chromitites. These olivine inclusions show the same/continuous optical extinction as the adjacent and large olivines in the dunite. The Cr# of chromian spinel in the dunite clots and the massive podiform chromitites falls within a very narrow range (Cr#=0.42-0.52). However, the Cr# of the chromian spinel in the dunite clots (Cr#=0.47-0.52) is slightly higher than the massive podiform chromitites (Cr#=0.46-0.0.48). The former similarly shows higher Fe3+ content than the latter. TiO_2 content of the chromian spinels in the dunite clots and the massive podiform chromitites is generally low (<0.11 wt%). Olivines in the dunite clots show slightly lower Fo content (=93-95) than the olivines in the interstices of the massive podiform chromitites (=95-96). The former similarly have lower NiO contents (=0.40-0.59 wt%) compared to the latter (=0.50-0.84 wt%). The occurrence of the well-preserved dunite clots in the massive podiform chromitites possibly provide us with evidence to indicate the chromian spinel-oversaturated character of the melt involved in the formation of podiform chromitite. The existence of such type of melt was only hypothesized by Irvine (1977) based on the interpretation of stratiform chromitite genesis.