

Re-Os isotope and PGE abundance systematics of Coast Range ophiolite peridotites and chromitite, California: Insights into fore-arc magmatic processes

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We report platinum-group element (PGE) and Re concentrations, and Re-Os isotopic data for peridotites and podiform chromitite from the mid-Jurassic Coast Range ophiolite (CRO), California. Our aim is to provide insights into the formation and evolution of the CRO in a forearc tectonic setting. The CRO peridotites are divided into two groups: abyssal and supra-subduction zone (SSZ). They have Ir-group PGE (IPGE) concentrations similar to estimates for the primitive mantle, and nearly chondritic relative abundances $[(\text{Os}/\text{Ir})_{\text{N}} \gg 1.1]$. Abyssal-type peridotites have slightly sub-chondritic Pd-group PGE (PPGE)-Re abundances and flat chondrite-normalized patterns, whereas the SSZ-type ones are depleted overall with highly fractionated PPGE-Re patterns. The CRO peridotites have $^{187}\text{Os}/^{188}\text{Os}$ values of 0.1188 to 0.1315 ($\gamma_{\text{Os}} = -8.3$ to $+1.4$), and $^{187}\text{Re}/^{188}\text{Os}$ ranging from 0.022 to 0.413. The oxygen fugacity based on the V/Yb ratios of the CRO peridotites is equivalent to the FMQ buffer. The abyssal-type peridotites are residues after $\leq 5\%$ melting of the primitive upper mantle, and represent a remnant of oceanic lithosphere trapped in an SSZ setting but before it was re-melted or modified by subduction processes. The abyssal-type peridotites yield an aluminachron model age of ~ 1.5 Ga, implying that the CRO mantle had experienced episode(s) of melt extraction before the CRO crust was formed. The SSZ-type peridotites are refractory residues after ~ 5 to 15% melting. Extraction of fore-arc basalts generated mainly by decompression melting resulted in the SSZ-type peridotites. The chromitite has $^{187}\text{Os}/^{188}\text{Os}$ value of 0.1250 ($\gamma_{\text{Os}} = -3.5$), and PGE-Re patterns complementary to that of boninite, indicating a genetic link to fore-arc magmatism.