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Platinum Group Elements (PGE)-Re Geochemistry and Re-Os Isotope signatures of the Mantle Peridotites from the Aladağ Ophiolite (S-Turkey)

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Mantle section of the Aladağ ophiolite, outcropping at the eastern Taurides in the southern Turkey, are represented by variously depleted peridotites ranging from lherzolite to harzburgite and dunite. The peridotites contain spinel phases with wide range of Cr [100×Cr/(Cr+Al)] and their whole-rock Lanthanum Group Element (LGE) contents show wide range of variation. The Group-1 mantle peridotites are characterized by relatively low spinel Cr values (13-47) and slightly depleted heavy LGE contents compared to the primitive mantle, analogous to abyssal peridotites. Chondrite-normalized PGE (Os, Ir, Ru, Pt, Pd) and Re patterns show relatively flat patterns opposite to what is expected for the depleted mantle rocks. This may suggests the addition of Cu-Ni sulphides during the interaction of the low-degree partial melt, produced from the deeper and more fertile part of the mantle during the ocean opening, passing through the shallower depleted peridotites. The enriched $^{187}Os/^{188}Os$ composition of these low-degree melting residues of Group-1 peridotites compared to the DMM requires the radiogenic Os input during their evolution. This may indicate that the percolating melts that enriched the slightly depleted mantle in secondary Cu-Ni sulphides at various extent was rich in radiogenic Os, and probably formed due to the melting of radiogenic Os rich source (e.g., pyroxenites) in deeper mantle. Most of the Group-1 peridotites give negative TRD ages. Only one sample that has lower $^{187}Os/^{188}Os$ ratio gives a TRD age of 556 Ma. Group-2 samples are characterized by higher spinel Cr values (44-74) and higher degree of depletion in heavy LGE and middle LGE contents relative to the primitive mantle. They show significant enrichments in light LGE as the typical characteristics of the supra subduction zone peridotites. The chondrite-normalized PGE-Re contents of Group-2 samples show different patterns. Most of the samples show almost flat to slightly negative PGE-Re patterns from Os to Re which contradict to their highly depleted nature. However, some samples show depletion from Os to Re but these samples are characterized by positive Pt and Pd anomalies. This shows that the Group-2 peridotites are enriched in sulphide phases during the interaction with PPGE (Pt, Pd) and Re rich melts that probably derived from the oceanic crust during subduction processes. Pt and Pd positive anomalies in some samples may be explained by selective enrichment of these elements in some sulphide-alloy phases. Highly depleted Group-2 samples, containing very low Al_2O_3 contents, are represented by highly variable $^{187}Os/^{188}Os$ ratios. The ancient melt depletion (TRD ages of up to 2.1 billion years) events recorded in some of the Group-2 peridotites indicate that the mantle wedge, from which the SSZ type oceanic crust of the Aladağ ophiolite formed due to its hydrous melting during the Neotethyan ocean closure, was experienced melting events even long before the Neotethyan ocean opening. However, the enriched 187Os/188Os composition of some of the highly depleted Group-2 peridotites may also require the addition of radiogenic Os from the subducting oceanic crust to mantle wedge during the closure of Neotethyan ocean.

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