Multistage evolution of the Aladağ mantle peridotites (S-Turkey): implications from whole rock and mineral chemistry

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The Aladağ ophiolite, outcropping at the eastern Taurides in the southern Turkey, is represented by varying degrees of serpentinized dunite, harzburgite and lherzolite and overlying crustal rocks. The mantle peridotites are divided into two subgroups. Al_2O_3 (0.61–2.66 wt.%), CaO (0.52–3.00 wt.%) and heavy Lanthanum Group Elements (LGE) contents of Group-1 mantle peridotites are less depleted compared to Group-2 samples (010–1.34 wt.% and 0.11–1.40 wt.%, respectively) although samples from both groups show depletion compared to the primitive mantle. Light LGE contents of especially Group-2 samples show enrichment compared to middle LGE. Olivine from the Aladağ peridotites is highly magnesian ($Fo_{89.4-92.8}$) with NiO contents ranging between 0.35 and 0.56 wt.%. Group-1 samples are characterized by relatively low spinel Cr# (12-52) and high Mg# values (52-76) while the Group-2 samples are characterized by higher spinel Cr# (39-75) and lower Mg# values (39-67). The Cr# values increase and the Mg# values decrease systematically from Group-1 to Group-2 samples, indicating 5 to 40% melting for the formation of peridotites. Mineral and whole-rock composition show that Group-1 samples plot mostly within abyssal peridotites whereas the Group-2 samples scatter within SSZ peridotite fields.

We suggest that the Aladağ peridotites have formed originally by low degree partial melting at mid-ocean spreading ridge (MOR) and later re-melted and metasomatized/refertilized in a suprasubduction zone (SSZ) environment.

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