Sm-Nd and Lu-Hf isotope systematics of Nakhlite NWA 10153

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Northwest Africa (NWA) 10153 is the ninth known specimen in the nakhlite suite of meteorites. It is a cumulate textured, olivine-bearing clinopyroxenite with minor amounts of interstitial plagiocase [1]. In this report, we present Sm-Nd and Lu-Hf isotopic data for NWA 10153, including the first Lu-Hf nakhlite isochron age, and correlate these age and isotope data with those of other nakhlites and discuss their petrogenesis.

The $^{147}Sm/^{144}Nd$ and $^{143}Nd/^{144}Nd$ data of eight samples were measured. Five samples, one pyroxene, two whole rock and two acid residues (pyroxene(r) and plagioclase(r)) form a linerar array corresponding to an age of 1419±56 Ma (MSWD =0.57) with an initial $\varepsilon^{143}Nd$=+14.0±0.4. The $\mu^{142}Nd$ for NWA 10153 is +53.2±6.6 and is lower than the average value of +63 for Nakhla, MIL 03346 and Yamato 000593[Debaille]. The $^{176}Hf/^{177}Hf$ and $^{176}Hf/^{177}Hf$ data of four samples were also measured. All four fractions form a linear array corresponding to an age of 1360±33 Ma (MSWD=0.53) with an initial $^{176}Hf/^{177}Hf$ = 0.282009±16. This is the first mineral Lu-Hf isochron obtained from a nakhlite, and is in agreement with the ^{147}Sm-^{144}Nd age obtained from the same sample aliquots.

The isochron ages of NWA 10153 agree well with published nakhlite ages, suggesting that the suite of nakhlites are derived from the same or similar magmatic system. The initial isotope compositions and $\mu^{142}Nd$ could suggest variable mantle sources within the suite of nakhlites, with NWA 10153 being derived from more enriched components. Alternatively, assimilation of crustal material during magma ascent and emplacement could also explain the more enriched initial isotope compositions. The latter scenario would be consistent with petrographic observations of late stage igneous water-bearing materials in NWA 10153 [1].

[1] Irving et al. (2015) *MaPS*, **50**, A179.