NEODYMIUM, SAMARIUM AND GADOLINIUM ISOTOPIC STUDIES OF LUNAR METEORITES DHOFAR 489 AND NWA 032.

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Introduction: Geochemical studies of lunar meteorites are expected to offer new information that has not been known from the Apollo and Luna missions samples. We report here isotopic compositions of Nd, Sm and Gd of two lunar meteorites NWA 032 and Dhofar 489, and compare the data with those of lunar soils and rocks. Isotopic determination of Nd leads to ^{147}Sm-^{143}Nd and ^{146}Sm-^{142}Nd chronometry to consider early differentiation of the samples from lunar mantle. Isotopic compositions of Sm and Gd are used to characterize exposure history of the samples from isotopic shifts on ^{149}Sm-^{150}Sm and ^{157}Gd-^{158}Gd due to neutron capture effect.

Samples and Experiments: NWA 032 is a crystalline mare basalt [1]. Dhofar 489 is an anothostic breccia with magnesian mafic silicates [2]. Besides two lunar meteorites, two soils, 70002 and 70004, and two rocks, 60626 and 77017 were also used for this study. Each sample weighing 20-80 mg was decomposed by HF+$HClO_4$. After evaporation to dryness, the sample was redissolved in 2M HCl. Conventional ion exchange techniques using two column procedures were carried out to chemically separate Nd, Sm and Gd [3]. A Micro-mass VG 54-30 thermal ionization mass spectrometer equipped with seven Faraday cup collectors was used for the isotopic measurements.

Results and Discussion: Sm and Gd isotopic shifts provide neutron fluences of Ψ=0.53x10^{16} and 2.58x10^{16} n cm^{-2} for Dhofar 489 and NWA 032, respectively. Small fluence of Dhofar 489 suggests short exposure time and/or deep ejection depth, which is consistent with low concentrations of cosmogenic ^{10}Be and ^{41}Ca [4]. On the other hand, large fluence of NWA 032 is consistent with long CRE ages of 226-227 Ma supported by ^{38}Ar production rate [5].

Dhofar 489 shows a small enrichment of ^{142}Nd (ε_{142Nd}= +0.24±0.19), even considering neutron capture effect on Nd isotopes. Therefore, the ^{142}Nd isotopic excess of Dhofar 489 is concluded to be due to decay from ^{146}Sm. Although the Nd isotopic data of other lunar samples are in progress, ^{147}Sm-^{143}Nd and ^{146}Sm-^{142}Nd systematics of a suit of data from lunar materials may put constraints to construct the model of early differentiation and evolution of lunar mantle and crust [6].

References:

[1] Fagan et al. 2002. *Meteoritics & Planetary Science* 37: 371-394. [2] Takeda et al. 2003. Abstract #1284. 34th Lunar and Planetary Science Conference. [3] Hidaka et al. 1995. *Anal. Chem.* 67: 1437-1441. [4] Nishiizumi et al. 2004. Abstract #1130. 35th Lunar and Planetary Science Conference. [5] Fernandes et al. 2001. *Meteoritics & Planetary Science* 36: A57. [6] Nyquist et al. 1995. *Geochim. Cosmochim. Acta* 59: 2817-2837.