Sm-Nd AND Rb-Sr AGES FOR NORTHWEST AFRICA 2977, A YOUNG LUNAR GABBRO FROM THE PKT.
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Introduction: Northwest Africa (NWA) 2977 is an olivine gabbro cumulate equivalent to one of the lithologies in lunar mare breccia NWA 773 [1,2,3]. The ^{39}Ar-^{40}Ar age is 2.77±0.04 Ga based on the last ~57% of the gas release [4], similar to results for NWA 773 [5]. A Sm-Nd age (T) of 2.865±0.031 Ga and ε_{Nd} = -7.84±0.22 for the NWA 773 gabbro reported by [6] has been revised to T = 2.993±0.032 Ga, ε_{Nd} = -4.5±0.3 [7].

^{147}Sm-^{143}Nd isochron for NWA 2977: Whole rock, pyroxene, olivine, plagioclase, whole rock leachate (~phosphate) and the combined leachates from the mineral separates yield a well defined Sm-Nd isochron for an age T = 3.10±0.05 Ga and $\varepsilon_{Nd,CHUR}$ = -3.74±0.26 [8], or $\varepsilon_{Nd,HEDR}$ = -4.61±0.26 [9].

^{87}Rb-^{87}Sr isochron: NWA 2977 contains only a modest amount of Rb and/or Sr contamination. The Sr-isotopic composition of the contaminant closely resembles that of seawater. The whole rock residue after leaching combined with leach residues for plagioclase and pyroxene define an isochron age of 3.29±0.11 Ga for initial ^{87}Sr/^{86}Sr = 0.70287±18. The olivine residue, with lower Sr abundance of ~ 1.5 ppm, is only slightly displaced from the isochron. The relatively small uncertainties of the Rb-Sr isochron parameters and near-concordancy with the Sm-Nd age indicate that both the Rb-Sr and the Sm-Nd ages are reliable.

Discussion: The somewhat older Rb-Sr and Sm-Nd ages of NWA 2977 compared to its ^{39}Ar-^{40}Ar age suggest some radiogenic ^{40}Ar* loss from the sample analyzed by [4]. Initial ε_{Nd} for NWA 2977, when combined with ε_{Nd} for KREEP-rich samples, defines a line that when extrapolated passes between the CHUR and HEDR values at 4.568 Ga ago. Both types of samples lie within error limits of Nd-isotopic evolution for ^{147}Sm/^{144}Nd ~0.177 characteristic of KREEP-rich sources. Also, ε^{142}Nd for NWA 2977 is the same within error limits as for KREEP melt rock 14310 [10]. The ^{142,143}Nd isotopic evolution can be modeled for: (a) 50 Ma with chondritic ^{147}Sm/^{144}Nd (μ_{CHUR}) = 0.1967, (b) 168 Ma with μ_{moon} = 0.205, (c) 1250 Ma with source region μ_S = 0.173 (present-day values). A two-stage model for Sr-isotopic evolution gives ^{87}Rb/^{86}Sr ~0.207 in the NWA 2977 source, compared to ~0.18 in the rock and ~0.14-0.17 in the sources of A14 and A15 KREEP basalts. The NWA 2977 source evidently contained highly evolved Trapped Instantaneous Residual Liquid [11]. The age, Sr-and Nd-isotopes, and trace element abundances suggest an origin in the PKT (Procellarum KREEP Terrane).

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