Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.38226

The Role of KREEP in Prolonging Lunar Magmatism: The Tale from Two Young Lunar Basalts

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In recent years, sample return missions (Chang'e 5 and 6) and new lunar meteorites such as Northwest Africa (NWA) 16286 have provided samples of the three youngest lunar magmas currently known, which offers a pathway to investigating the mechanisms by which magma generation on the Moon continued at least ~1 byr after its differentiation. Here we present bulk compositional, isotopic, and mineral chemical data for NWA 16286, which has been recently dated to ~2.2 Ga [1], and compare this magma to the 2.0 Ga basalt returned by the Chang'e 5 mission [2, 3]. These are currently the two youngest known lunar igneous samples.

Our data and literature data [1] for NWA 16286 show it is an unbrecciated basalt with a similarly low Mg# to the Chang'e 5 (CE5) basalt (Mg# of 35 vs. 32 for CE5). Both samples exhibit high abundance of REEs and LREE enrichment, and nearly identical δ^{57}Fe of 0.141 ± 0.025‰ (2SE) for NWA 16286 [5] and 0.161 ± 0.010‰ for CE5 [4], which is on the higher end of lunar low-Ti basalts, but lower than high-Ti basalts and KREEP basalt 15286. NWA 16286 is also a moderate-Ti basalt and high-K basalt, which is unique in the lunar meteorite collection.

Perhaps the most insightful difference, however, is that the radiogenic Pb and Nd isotopic compositions of these samples show that despite their shared LREE-enrichment, only NWA 16286 has evidence of direct KREEP involvement. We will perform additional Sr isotopic measurements for NWA 16286. For CE5, despite the magma being derived from a depleted source region, Elardo et al. [3] attributed source melting to indirect heat from a subcrustal KREEP layer. These two samples highlight the variable direct and indirect roles that KREEP plays in prolonging lunar magmatism.

[1] M.-H. Yang, *et al.*,. *Science Bulletin* **70**, 3265–3271 (2025).

[2] H. C. Tian, *et al.*,. *Nature* **600**, 59–63 (2021).

[3] S. M. Elardo, *et al.*,. *Science Advances* **11**, eadr1486 (2025).

[4] Y. Jiang, *et al.*,. *ApJL* **945**, L26 (2023).

[5] E. A. Pesar, *et al.*,. *This Conf.* (2026)