

PETROLOGY AND REE GEOCHEMISTRY OF THE LUNAR METEORITE SAYH AL UHAMIR 300

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Introduction: Sayh al Uhamir 300 (SaU 300) is a newly recovered lunar meteorite from Oman. It was classified as a feldspathic regolith [1,2]. This meteorite has a Fe/Mn ratio of 71, Al₂O₃ content of 20.4 wt %, FeO + MgO of 16.7 wt%, and Th of 0.46 ppm [2]. Its chemical composition falls into the range of mingled basaltic-feldspathic breccias [2,3].

Petrology: SaU 300 is predominantly composed of fine-grained matrix with abundant mineral fragments and a few polymict breccias (anorthosite, troctolitic anorthosite, noritic gabbro, and anorthositic gabbro). Numerous euhedral to subehedral mineral fragments (~ 100 m) of olivine, anorthite, and pyroxenes are set in the fine-grained matrix. Lithic clasts appear in angular to round shapes and range in size from several hundred microns to a few mm. Glass veins (50 m wide), FeNi and troilite grains are also observed in the section.

REE geochemistry: REE microdistributions in SaU 300 were analyzed with the ASU Cameca 6f ion microprobe. Measurements were carried out in olivine, anorthite, pyroxenes, and apatite within lithic clasts and the fine-grained matrix. Because of the small grain size (< 50 m) and inclusion, olivine analyses are often contaminated by a small amount of anorthite. After excluding the contribution from anorthite, olivine exhibits a HREE-enriched pattern with Lu at 3-10×CI and Gd at 0.4-0.6×CI. Within the same clast, olivine has relatively homogeneous REEs. REEs vary by a factor of 3 in olivine from different clasts. Anorthite varies significantly in REEs both within clasts and among different clasts. It has a relatively LREE-enriched pattern with a positive Eu anomaly (~ 20×CI). La varies from 0.8 to 22×CI and Y, an analog of HREE, from 0.5 to 8×CI. Both high-Ca and low-Ca pyroxenes were analyzed. They exhibit typical HREE-enriched pattern with a negative Eu anomaly. High-Ca pyroxene has higher REEs (La 3-25×CI, Lu 20-50×CI) than low-Ca pyroxene (Lu 3-10×CI). One anorthositic clast contains an apatite grain (30×150 m). Apatite has very high REEs with a relatively LREE-enriched pattern (La 2800×CI and Lu 650×CI) and a negative Eu anomaly (Eu 30×CI). It is very similar to apatite from lunar highlands [4] and from the lunar meteorite EET 96008 [5]. Glass veins have homogeneous REEs with a relatively LREE-enriched (La 17×CI, Sm 12×CI), a positive Eu anomaly (Eu 17×CI) and a relatively flat HREE (12×CI) pattern. Its REEs fall into the range of lunar highlands meteorites [5,6].

Conclusion: Petrological and geochemical signatures of SaU 300 are in many ways similar to those of lunar highlands meteorites. SaU 300 is primarily a feldspathic regolith breccia with small amounts of mare components.

References: [1] Bartoschewitz R. et al. 2005 Abstract #5023, 68th Annual Meteoritical Society Meeting. [2] Bartoschewitz R. et al. 2005 Abstract #5024, 68th Annual Meteoritical Society Meeting. [3] Korotev R. L. 2005. *Chemie der Erde* 65:297-346. [4] Lindstrom M. M. et al. 1985 *Lunar & Planetary Science Conference XVI*, 493-494. [5] Anand M. et al. 2003, *Geochimica et Cosmochimica Acta* 67:3499-3518. [6] Korotev R. L. 2003 *Geochimica et Cosmochimica Acta* 67:4895-4923.