SAYH AL UHAYMIR 300 – THE MOST MAFIC OF THE FELDSPATHIC LUNAR METEORITES

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SaU (Sayh al Uhaymir) 300 is a 153-g lunar meteorite from northern Oman. Originally described a feldspathic regolith breccia [1], it has recently been as classified an feldspathic, crystalline impact-melt breccia [2]. We have analyzed 11 subsamples of the stone with a total mass of 321 mg by INAA (instrumental neutron activation analysis) for some major elements and a variety of trace elements. These data supplement our previously reported data [3].

SaU 300 is compositionally distinct from other nominally feldspathic lunar meteorites. With 7.8% FeO and 18 ppm Sc, it is compositionally more mafic (others range from 3% to 6% FeO). In this regard, SaU 300 is more similar to "mingled" meteorites Yamato 983885 (8.6% FeO), Dhofar 1180 (9.2%), Calcalong Creek (9.7%), and NWA 2995 (9.8%), all of which are regolith or fragmental breccias. Mingled meteorites are richer in Fe and Sc than feldspathic meteorites because the mingled breccias contain mare basalt. However, little or no mare material has been reported in SaU 300 [1,2,4]. This observation suggests that SaU 300 is, indeed, the most mafic of the feldspathic lunar meteorites. It is a sample of the lunar highlands, one at the mafic end of range of noritic anorthosites (63 vol% plagioclase calculated from normative concentration of 57% wt%).

Concentrations of incompatible elements in SaU 300 are low (Sm: 1.2 ppm), in contrast to the truly mingled (anorthosite-basalt-KREEP [5]) meteorites mentioned above (2.8–8.6 ppm). Sm/Sc (0.069) is only slightly greater than that of Apollo 16 plutonic anorthositic norite 67513 (0.057) [6], suggesting that SaU 300 is largely uncontaminated by KREEP and does not contain any significant component of near-surface material [7]. This inference is in agreement with the low concentrations of solar-wind gases [8].

As we noted earlier [3], SaU 300 is rich in siderophile elements, presumably from the impactor that formed the melt from which it crystallized. Ir/Au is 3.5, i.e., the same as in H chondrites. A 2.5% component of H chondrite accounts for all of the Ir (19 ppb) Au (5.5 ppb), and 400 ppm of the 440 ppm Ni.

In some respects, SaU 300 resembles NWA 3163 [9], a granulitic breccia that is less mafic (5.9% FeO) and which has remarkably low concentrations of incompatible elements (0.5 ppm Sm). We are unable to find any mixture of NWA 3163 and a reasonable lunar material that accounts for the composition of SaU 300, however.

References: [1] Bartoschewitz et al. 2005. 68th Annual Meteoritical Society Meeting. Abstract #5023. [2] Hudgins J. A. et al. 2007. 38th Lunar and Planetary Science Conference. Abstract #1674. [3] Bartoschewitz et al. 2005. 68th Annual Meteoritical Society Meeting. Abstract #1423. [4] Hsu et al. 2007. 38th Lunar and Planetary Science Conference. Abstract #1149. [5] Korotev R. L. 2005. *Chemie der Erde*, 65:297–346. [6] Jolliff B. L. and Haskin L. A. 1995. Geochimica et Cosmochimica Acta 59:2345–2374. [7] Korotev R. L. et al. 2006. Geochimica et Cosmochimica Acta 70:5935-5956. [8] Bartoschewitz et al. 2005. 68th Annual Meteoritical Society Meeting. Abstract #5026. [9] Irving A. J. et al. 2006. 37th Lunar and Planetary Science Conference. Abstract no. 1365.