

MAGNESIAN ANORTHOSITIC CLASTS IN LUNAR METEORITES ALHA 81005 AND DHO 039: BULK COMPOSITIONS AND REGIONAL SIGNIFICANCE.

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Introduction: Lunar meteorites Allan Hills A81005 and Dhofar 309 (the former a regolith breccia, the latter a clast-laden impact melt) contain clasts of magnesian anorthositic troctolitic rock with nearly identical chemical compositions. As these meteorites are not source-paired, magnesian anorthositic troctolite may be a widespread rock composition on the lunar farside (Feldspathic Highland Terrane) [1-3].

Methods: EMP and SIMS were used to obtain major and trace element abundances for five magnesian anorthositic clasts. Mineral proportions were calculated from EMP X-ray maps using computer codes for multispectral image analyses [4]. Bulk clast compositions were then calculated from mineral analyses and mineral proportions.

Results: The magnesian anorthositic clasts in ALHA 81005 and Dho 309 are chemically similar: Mg' (molar Mg/(Mg+Fe)) = 81-87, ~5% FeO, ~21-24% Al₂O₃, Eu at ~ 10 x CI, and other rare earth elements (REEs) at 0.5-2 x CI [5]. Takeda et al. [6] describe similar clasts in Dho 489, which is paired with Dho 309. Ni and Co abundances are low, and Ni/Co = 0.04-0.2 x CI suggest limited chondritic (meteoritic) contributions. Cr₂O₃ abundances are variable, from 0.01 to 0.4%. Clasts in ALHA 81005 have more TiO₂ than those in Dho 309 (0.15% vs. <0.1%).

Implications: Lunar remote sensing and bulk analyses of lunar meteorites show that the lunar crust must include magnesian, feldspathic, REE-poor lithologies that are not represented in the Apollo collections [1-3]. This material dominates the northern lunar farside – an area called the Feldspathic Highlands Terrane. Lunar Prospector gamma-ray data suggest that the FHT averages ~4.5 wt% FeO, ~28 wt% Al₂O₃, and low abundances of Th (less than 1 ppm) and other highly incompatible elements. The magnesian anorthositic clasts analyzed here are reasonable candidates for this composition, although they contain rather less Al₂O₃. ALHA 81005 and Dho 309 are not source-paired (i.e., they did not come from the same locality on the Moon), because they have different pre-terrestrial ages [7,8]. Thus, it seems reasonable that the magnesian anorthositic compositions of these meteorites' clasts is widespread on the Moon, and may represent a common component of the Moon's Feldspathic Highlands Terrane.

References: [1] Jolliff B.L. et al. 2000. *Journal of Geophysical Research* 105:4197-4216. [2] Gillis J.J. et al. 2004. *Geochimica et Cosmochimica Acta* 68:3791-3805. [3] Korotev R.L. et al. 2003. *Geochimica et Cosmochimica Acta* 67:4895-4923. [4] Maloy A.K. and Treiman A.H. 2007. *American Mineralogist*, accepted. [5] Maloy A.K. and Treiman A.H. forthcoming. [6] Takeda H. et al. 2006. *Earth and Planetary Science Letters* 247:171-184. [7] Eugster O. 2003. *Chemie der Erde* 63:3-30 [8] Nishiizumi K. and Caffee M.W. 2006. *Meteoritics & Planetary Science* 41:A133.