Lunar meteorite SaU 169; An extremely KREEP-rich rock

Conference or Workshop Item

LUNAR METEORITE SaU 169; AN EXTREMELY KREEP-RICH ROCK. E. Gnos[1], B. A. Hofmann[2], A. Al-Kathiri[1], S. Lorenzetti[3], I. Villa[1], O. Eugster[3], A. J. T. Jull[4], J. Eikenberg[5], B. Spettel[6], U. Krähenbühl[7], I. A. Franchi[8], G. C. Greenwood[8], [1]Institut für Geologie, Universität Bern, Baltzerstrasse 1, 3012 Bern, Switzerland, gnos@geo.unibe.ch, [2]Naturhistorisches Museum Bern, Bernastrasse 15, 3005 Bern, Switzerland, [3]Physikalisches Institut, Universität Bern, Sidlerstrasse 5, 3012 Bern, Switzerland, [4]NSF Arizona AMS Laboratory, University of Arizona, 1118 East Forth St, Tucson AZ 85721, USA, [5]Paul Scherrer Institut, 5232 Villigen, Switzerland, [6]Max-Planck-Institut für Chemie, 55020 Mainz, Germany, [7]Departement für Chemie und Biochemie, Universität Bern, Freiestrasse 3, 3012 Bern, Switzerland, [8]Planetary Sciences Research Institute, The Open University, Milton Keynes MK7 6AA, United Kingdom.

Introduction: Sayh al Uhaymir 169 is a new lunar meteorite [1] collected in Oman in January 2002 (Fe/Mn of 74-79; K/U of 535-1682; $\Delta^{17}O$=0.001 ± 0.032‰). It consists of an extremely KREEP-rich (Th: 32.7 ppm; U: 8.6ppm; K_2O: 0.54wt%; REE_{tot}:~1330 ppm; P_2O_5: 1.14wt%; Zr: 2835ppm) anorthosite-free impact-melt breccia and adherent KREEP-rich regolith (Th: 8.4 ppm).

Impact melt breccia: The fine-grained crystalline matrix consists of 85.1% shortprismatic low-Ca pyroxene ($En_{61-64}Wo_{2-4}$), 26.4% interstitial plagioclase (An_{75-81}) intergrown with potassium feldspar. The remaining minerals are poikilitic ilmenite, whitlockite, olivine (Fo_{58-59}), zircon, and traces of troilite, kamacite, and tridymite. The impact melt breccia contains 25-40 vol% of strongly shocked magmatic rock and crystal clasts derived from norites, evolved magmatites, and granulites. Only one KREEP basalt clast was observed.

Regolith: The regolith contains two clearly separable parts. Both parts comprise crystalline and glassy volcanic rocks, magmatic lithic fragments, breccia fragments, fragments of mafic granulites, and crystal fragments. The younger regolith is bordered by a gas-bubble-rich yellowish flow-banded glass and contains yellow and orange glass fragments and beads, olivine-basalts, and pyroxferroite-bearing basalts.

Interpretation: Combined chemical and isotope information, regolith mineralogy, and remote sensing data [2-3] show that the rock most likeley represents a fragment from the Imbrium impact melt breccia excavated by another impact. After this event the material remained >200 Ma as part of a regolith near the surface of the Moon. Finally it was launched into space at maximum 0.85 Ma ago before colliding with the Earth at the end of the last large glaciation 9700 ± 1300 years ago.

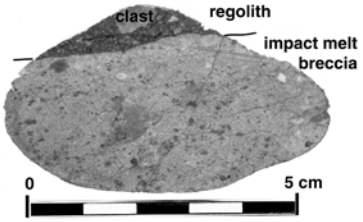

Fig. 1

References: [1] Russell, S. et al. (2003)) *Meteorit. Planet. Sci., 38,* in prep. [2] Jolliff B. L. et al. (2000) *J. Geophys. Res., 105,* 4197-4216. [3] Lawrence D. J. et al. (1999) *Geophys. Res. Lett., 26,* 2681-2684.