Geophysical Research Abstracts, Vol. 8, 00732, 2006
SRef-ID: 1607-7962/gra/EGU06-A-00732

Lunar meteorite regolith breccias MET 01210, DaG 400 and PCA 02007: Their geochemistry and importance in understanding the nature of the lunar surface.

K.H. Joy (1,2) and I.A. Crawford (1)

(1) The Joint UCL/Birkeck Earth Sciences Department, University College London, Gower Street, London, WC1E 6BT, UK (k.joy@ucl.ac.uk) (2) The Rutherford Appleton Laboratory, Didcot, Oxfordshire, UK.

Lunar meteoritic samples are constantly adding to our knowledge of lunar lithological variation. We will present data about two new Antarctic lunar meteorites; MET 01210 and PCA 02007, and the Libyan hot desert meteorite DaG 400 and provide evidence that they have originated from the Moon. All three meteorites are breccias and represent samples of fused lunar soil or regolith that originated from mare, highland or compositionally mixed lunar regions. They contain a wide range of mineral fragments and clasts of bedrock and impact melt material which have been investigated to provide interpretations of their local lunar regolith environment.

MET 01210 is a mare regolith breccia: it consists of fragments of basaltic material that is similar to Apollo and Luna samples collected from near-side mare regions of the Moon. Its' bulk rock chemical composition (in oxide wt. %) is: 44.03% SiO_2, 16.60% Al_2O_3, 16.46% FeO, 6.20% MgO,12.96% CaO, 0.32% Na_2O, 0.06% K_2O,1.55% TiO_2, 0.05% P_2O_5, 0.22% MnO, (98.44% Total), 0.855 ppm Th, 1.34 ppm Rb, 163ppm Sr.

PCA 02007 is a regolith breccia with mixed affinities. It is mostly feldspathic in nature but contains a small mare basalt component and a variety of impact melt derived clasts. Its' bulk rock chemical composition (in oxide wt. %) is: 43.41% SiO_2, 25.71% Al_2O_3, 6.30% FeO, 6.80% MgO, 15.19% CaO, 0.36% Na_2O, 0.03% K_2O, 0.28% TiO_2, 0.03% P_2O_5, 0.09% MnO, (98.3% Total), 0.370 ppm Th, 0.588 ppm Rb, 144ppm Sr.

DaG 400 is a feldspathic regolith breccia, rich in feldspathic impact melt material, that originated from the lunar highlands probably on the far-side of the Moon. Its' heavily shock-altered clasts are much larger than the other two samples studied; suggesting that it represents a fused immature regolith breccia which has been thermally annealed and consolidated. Its bulk rock composition (in oxide wt. %) is: 41.42% SiO_2, 27.76% Al_2O_3, 3.61% FeO, 4.84% MgO, 17.24% CaO, 0.39% Na_2O, 0.08% K_2O, 0.17% TiO_2, 0.42% P_2O_5, 0.07% MnO, (95.99% Total),0.393 ppm Th, 0.882ppm Rb, 451*ppm Sr (*probably effected by terrestrial contamination).

As regolith breccias are samples of ancient lunar regolith material they are important in that they represent the mixed surface chemical compositions that are detected by remote sensing instrumentation e.g. Clementine, Lunar Prospector and SMART-1. We will discuss the important of understanding such complicated, mixed samples in the interpreting the remotely sensed composition of the surface of the Moon, with particular reference to D-CIXS, an innovative planetary X-ray spectrometer which is part of the SMART-1 payload.