

A STUDY OF THE MINERALOGY AND TEXTURES OF BASALT FINES FROM APOLLO 12 REGOLITH SAMPLE 12023-,155.

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Introduction: The Apollo 12 (A12) mission landed in the Eastern region of Oceanus Procellarum (OP). Crater size-frequency distribution measurements [1] indicate that some of the youngest lava flows on the Moon occur within OP and it is possible that young basalt fragments may have been incorporated into the regolith at the A12 landing site. This study aims to search for such fragments by examining basaltic fines from the A12 landing site and determining their composition. Samples will be dated using Ar-Ar dating. Here we present initial petrographic results for 12023-,155, consisting of 12 fines ~ 2 mm in diameter.

Methods: Each individual grain was split in two with the larger split retained for petrographic analysis and the smaller split allocated for radiometric dating. Textures were examined using a JEOL JXA-8100 electron microprobe with an Oxford Instrument INCA energy dispersive system (EDS) to produce backscattered electron (BSE) images and elemental maps. Modal mineralogies were obtained from BSE images and elemental maps using imaging software to identify the phases. Bulk compositions were calculated using multiple raster beam analyses (RBA) across the samples that were corrected for differences in phase densities in accordance with [2]. These methods have been previously tested on known samples [3] and found to be in good agreement.

Results: Initial results indicate that these fines are generally typical of A12 low-Ti basalts [4], composed of pyroxene (48-60%), plagioclase (30-45%) and ilmenite (3-4%), with varying amounts of olivine (0-12%) and accessory silica and Cr-spinel. Traces of Fe-Ni metal and troilite occur rarely (<1%). Textures are varied but are mainly holocrystalline and subophitic. Highly zoned pyroxenes are the major mafic phase, which often enclose anhedral olivines. Plagioclase varies from fine subhedral laths to larger blocky textures, occasionally intrafasciculate, up to 1mm in length. Ilmenite commonly occurs as fine laths of varying lengths (50-600 µm) and also as irregular grains in some samples, while spinels are small (<100 µm) and zoned. Silica is present as randomly distributed, anhedral crystals. We have also identified a coarse-grained pyroxene cumulate in which ilmenite is absent.

Discussion: Most basalt fines have modal mineralogies consistent with pigeonite or feldspathic A12 basalt classifications [4], but exceptions are noted, which may require contributions from separate lava flows. Detailed mineral compositions (ongoing) will complete the chemical analysis of these samples. Results can then be evaluated together with Ar-Ar dating to understand the petrogenesis and source regions of basaltic grains collected at the A12 site.

References: [1] Hiesinger, H. et al. 2003. *Journal of Geophysical Research* 108, E7. [2] Warren, P.H. 1997. Abstract #1497. 28th Lunar & Planetary Science Conference. [3] Snape, J.F. et al. 2011. Abstract #2011. 42nd Lunar & Planetary Science Conference. [4] Papike, J.J. et al. 1998. Lunar Samples. *Reviews in Mineralogy*, 36, pp 5-1 – 5-234.