MODAL ANALYSES, GRAIN SIZE FREQUENCY DISTRIBUTIONS AND SCANNING ELECTRON MICROSCOPE STUDIES OF SOME APOLLO 17 FINES; George M. Greene, David T. King, Jr., Gordon S. Banholzer, Jr., and Elbert A. King, Department of Geology, University of Houston, Houston, Texas 77004.

Modal analyses of particle types in four fine size fractions (105-74, 44-37, 20-10 and 10-5 μm) of a number of Apollo 17 fines samples have been obtained using a combination of optical microscopy and scanning electron microscopy (SEM) techniques. In addition, the grain size frequency distributions of the 10-1 μm size fraction of each sample has been determined using the SEM.

A general pattern in the modal analyses of decrease of agglutinate content and increase of glass content with decreasing grain size seems to be typical of the fines studied (e.g., 75081,44 and 76321,10). Much of the glass in the finest size fractions appears to be derived from the comminution of agglutinates. A notable exception is the "orange glass" fines sample 74220,83, in which regularly shaped glass particles dominate the coarser two grain size fractions examined. The 10-5 μm glass is derived largely from the comminution of these large glass particles. Essentially undamaged regularly shaped glass accounts for only a very small percent of the particles in the less than 20 μm size fraction in all samples examined. Sample 76321,10, which was collected from the surface of boulder 1 is anomalous in that it has an abnormally large agglutinate content in the coarser size fractions (more than 70 modal percent in the 105-74 μm grain size fraction). Thus, the lithologic maturity of this fines sample is very high, but the overall grain size maturity is about average for this site (1). Sample 76321,10 may represent a fines sample with a large component of mature North Massif surface regolith mixed with less mature regolith. Alternatively, agglutinate formation may be enhanced by the presence of fine particles on boulder surfaces which may interrupt commonly longer ballistic trajectories of molten glassy spatter. This sample further illustrates the necessity to distinguish between grain size maturity and lithologic maturity (1).

Grain size analyses of the 10-1 μm size fractions of Apollo 17 fines samples mostly are similar with the exception of the "orange glass" sample 74220,83, which is finer grained and slightly bimodal in this size range. None of the features observed in the grain size frequency distributions appear to support the selective electrostatic transport of regolith particles. If electrostatic transport of lunar surface particles is an operative process, as has been suggested by other workers (2), it does not appear to be sorting particles in this size range.

References

(1) Butler, J. C. and Elbert A. King, Jr. (1974) Analysis of grain size frequency distributions of lunar fines: Geochim. Cosmochim. Acta, Suppl. 5, vol. 1, Proc. Fifth Lunar Sci. Conf., p. 829-841, Pergamon Press.

(2) Criswell, D. R. (1972) Lunar dust motion: Geochim. Cosmochim. Acta, Suppl. 3, vol. 3, Proc. Third Lunar Sci. Conf., p. 2671-2680, MIT Press.