APOLLO 16: CORE 60004 - ANALYSIS OF <1 MM FINES

Henry O.A. Meyer* and Robert H. McCallister**, *Dept. of Geosciences, Purdue University, West Lafayette, Ind. 47907
**Geophysical Lab., Carnegie Institution of Washington, Wash.D.C. 20008

Core 60004 is part of the drill core string which penetrated approximately 2 meters of the regolith at Station 10, Apollo 16. The section 60004 constitutes that portion between 70 cm and 110 cm depth. Twelve samples of less than 1 mm fines, randomly spaced throughout this length, have been analyzed for particle size, particle type, mineral content and chemical composition of constituent grains. The aim of the study being to uniquely characterize the various horizons in the core in order to understand better the physical conditions leading to formation of the lunar regolith. These conditions include how surface material is distributed and from whence it came, the destructive and constructive processes operating at the regolith surface, and the variation in exposure time at the lunar surface for the various horizons within the core.

Initially the samples were dry sieved using mesh sizes between 500μ and 40μ (ϕ, 1-4.64). No data were included for material greater than 1 mm which had been removed at the Curatorial facility during dissection of the cores. A marked bimodal distribution in grain size occurred for all samples throughout the core, with the major percentage of material being less than 64μ (ϕ, 3.98) in size. In all cases the minimum in the distribution fell in the 125-86μ (ϕ, 3-3.5) fraction (Fig. 1) with broad modes occurring between 500-125μ (ϕ, 1-2) and below 86μ (ϕ, 3.5). Bimodal distribution of <1 mm fines from Apollo 16 surface soils has been noted previously (1.). Cumulative size frequency distribution plots for each sample are fairly similar and all distributions lie within the region between the curves in figure 2. This region is also within that observed for other Apollo 16 fines in this size range (1.).

Qualitative examination indicates variation of agglutinate content as a function of depth. If agglutinate content is proportional to exposure age (2,3) then this would indicate a non-uniform rate for soil accretion. There is also a variation of agglutinate content for different size fractions of the same sample. For example, in sample 60004, 355 (approximately 38 cm depth in the core) the 250-125μ fraction consists of almost 50% agglutinates, whereas the fraction below 64μ contain a much lower percentage.

Besides agglutinates there are present glasses (green, yellow, brown, colorless), crystalline mineral fragments (plagioclase, pyroxene, olivine, spinel), rock fragments (predomi-

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nantly anorthositic types, both shocked and unshocked), breccias and some opaque particles (metals and opaque oxides). At this time there is insufficient data to attempt comparison and correlation between these samples from 70 to 110 cm depth and those obtained from the lunar surface. However, it appears that the soil samples, less than 1 mm size, examined from core 60004, form part of a heterogenous regolith.

References

1. Butler, J.C., G.M. Greene and E.A. King, Jr. (1973). Proc Fourth Lunar Sci. Conf., Geochim. Cosmichim. Acta, Suppl. 4, Vol. 1, 267-278.

2. McKay, D.S. and G.H. Heiken (1973) Ibid, 41-47.

3. Heiken, G.H. et al. (1973) Ibid, 191-213.

(Figures - next page)

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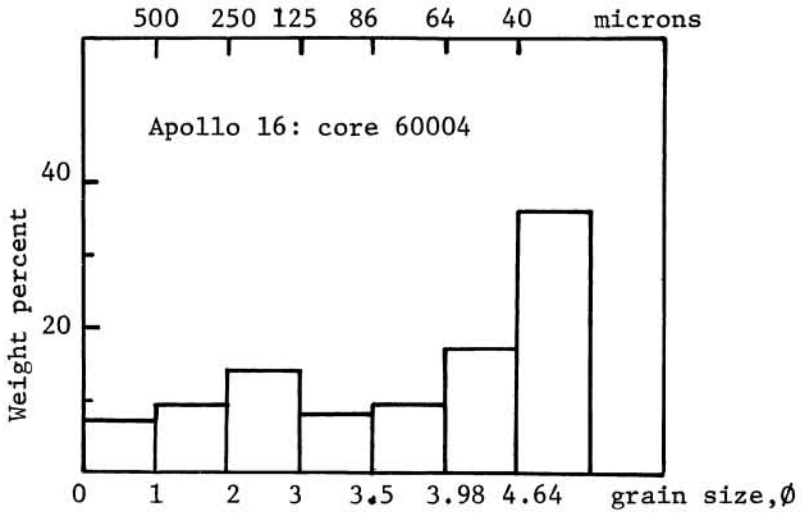

Fig. 1. Average frequency distribution for samples from core 60004.

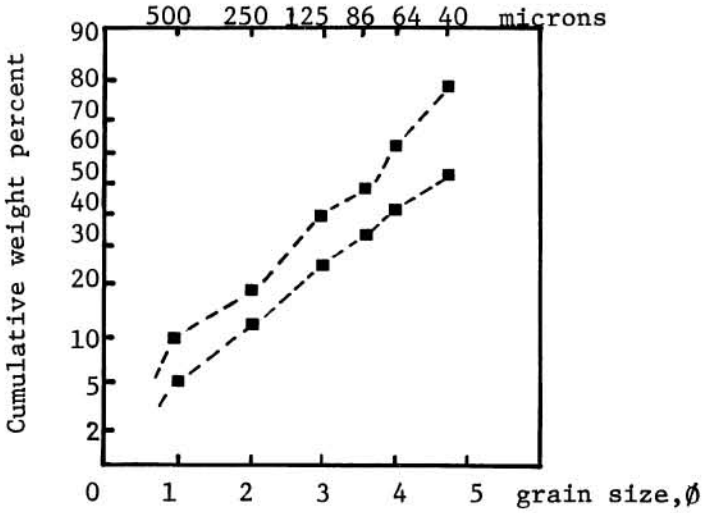

Fig. 2. Range of size frequency distribution curves, core 60004.