

APOLLO 17 1-2mm FINES - MINERALOGY; PETROLOGY I. M. Steele,  
A. J. Irving and J. V. Smith, Dept. of the Geophysical Sciences, University  
of Chicago, Chicago, Ill. 60637.

Nine Apollo 17 1-2mm soils (Table 1) were classified, sectioned, and examined petrographically; microprobe data were obtained from many of the fragments which were selected because of interesting features.

Table 1. % of fragment types

soil	station	wt.(g)	IB	LB	DB	glass	opx	cinders
72502,19	2	.25	0	43	44	0	0	13
73242,4	3	.25	0	40	57	3	0	0
75082,8	5	.25	51	2	9	0	0	38
78222,3	8	.25	8	8	33	0	0	51
78422,2	8	.25	6	10	34	10	6	34
78442,2	8	.25	4	28	28	0	1	39
78462,2	8	.26	5	14	42	1	0	38
78482,5	8	.25	7	12	36	0	0	45
78502,17	8	.50	43	6	26	15	4	6

IB = ilmenite basalt; LB = light breccia; DB = dark breccia; glass = nonvesicular glass; opx = single, large orthopyroxene grains; cinders = vesicular dark glass.

Soils from stations 2 and 3 sampled the base of the South Massif and the light mantle, respectively; they differ little, adding evidence that the light mantle was derived from the South Massif by downslope movement. Both contain a high % of LB which gives the soil its high albedo. The lack of IB suggests essentially no admixture from the mare area. The DB appears to be a component of the Massif because it is rare in the mare sample (Sta. 5). Station 5 on the mare floor consists mainly of IB and cinders as would be expected. Samples 78422 (bottom), 442, 462 and 482 (top) represent successive samples in a trench at the base of the Sculptured Hills; no trend of fragment type with depth is apparent, and in fact, all four soils are quite similar. The high % of cinders in all four soils suggest appreciable contribution from dark mantling material which has been characterized (1). Soil 78502 from station 8 has a very high % of IB indicating that the small crater near which this sample was collected, penetrated into the IB layers i.e. station 8 is probably underlain by IB. Soil 78222 was obtained under a boulder at sta. 8 and contains the highest % of cinders. Pre-mission analysis had indicated that dark mantling material contributed to the sta. 8 soils. If the mantle material is represented by the cinders and IB (common material at sta. 5), the soils from the Sculptured Hills would consist mostly of LB and DB; the ratio would depend on the DB contribution from the dark mantle material.

A minor but conspicuous component in the station 8 soils is coarse (1-2mm) single crystals of orthopyroxene, some with attached plagioclase and some with minor diopside-rich veins. This norite component is described in

## APOLLO 17 1-2mm FINES

I. M. Steele

another contribution in this volume.

Major element data were obtained from light-colored (LB) material in all soils to check for differences. Common characteristics include: (a) mafics with narrow compositional ranges for any one fragment and a wide compositional gap between high- and low-Ca pyroxenes: this indicates metamorphic equilibration; (b) invariably Mg-rich compositions ( $\text{mg} > 0.6$ ) for all olivines and pyroxenes with the mean value probably close to 0.70; (c) plagioclase compositions which are consistently Ca-rich (An 92-99) and have low minor element concentrations; these are features common to essentially all plagioclase-rich lunar rocks.

Of the four trench soils, the deepest (422 and 442) contain many LB fragments with  $\text{mg} > 0.8$  while the upper two soils contain none with  $\text{mg} > 0.8$  (some bias may be present due to initial choice of fragments to analyze). The two soils containing LB with  $\text{mg} > 0.8$  also contain single opx grains (see before). Mg-rich olivines comprise the bulk of a number of fragments and detailed examination shows numerous minute exsolved blebs indicating metamorphic equilibration. These fragments augment the number of ultrabasic fragments (high  $\text{mg}$  and mafic-rich) from the Moon.

Rare but conspicuous fragments include: a) pyroxene (50%) - euhedral, isotropic phase of plagioclase composition (50%) with minor olivine, ilmenite, metal and rutile. The isotropic phase is coarse ( $\sim .5\text{mm}$ ) and ranges from An 89-An 94 in composition with moderate contents of Fe (.04-.17) and K (.08-.16 wt.%). Pyroxene grains are small ( $\sim 0.1\text{mm}$ ) and uniform in composition whether enclosed by plagioclase or in the matrix (En 72, Fs 25, Wo 3); this suggests low temperature equilibration. Several grains of olivine (Fo 72) occur with the pyroxene. No shock features are present other than the isotropic phase; b) plagioclase-rich (60%) basalt with olivine as the only mafic. Olivine compositions are unusually Mg-rich (Fo 94-75 with an average  $\sim$  Fo 90). One large (.3mm) plagioclase xenocryst occurs which differs from the lath-shaped plagioclase with respect to Mg-content (xenocryst  $\approx .03$  wt.% Mg, lath-plag  $\approx .20$  wt.% Mg). Dark areas ( $\sim 5\%$ ) appear to be mesostasis with included minor ilmenite. The bulk composition of this fragment is essentially a mix of forsterite and anorthite, and the parental liquid must have a rather unusual composition. Impact melting of an olivine-plagioclase body is a possible source of this material; c) several 1mm fragments of high-Mg olivine (Fo 85-90) usually with cataclastic texture. Accessory phases include a deep-red isotropic phase (chromite?), opaque phase (armalcolite?) and plagioclase. A common feature of these olivines is minute exsolution (oriented) products indicating a metamorphic event; d) breccia with common Mg-rich olivine mineral fragments. (c) and (d) suggest an dunitic rock type as a minor but significant rock type; possibly rock 72415 (dunite) is a large example of this ultramafic component.

We acknowledge NASA Grant NGL 14-001-171.

(1) Heiken G. H. and D. S. McKay G.S.A. Abstracts, 5, p.663-664 (1973).