

COMPOSITIONAL AFFINITIES OF CLASTS AND MATRIX FROM BRECCIA,  
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Breccia 66055 consists of lithic and mineral fragments in a fine-grained, fairly coherent matrix. It was collected at the foot of Stone Mountain from a regolith developed on the Cayley Formation, but because of its angular shape, it is thought to represent ejecta from South Ray Crater. Thus, its stratigraphic affinity is somewhat uncertain.

Clast sizes range from less than 1 mm to greater than 4 cm, and several types of clasts can be distinguished on the basis of appearance and, in most cases, on the basis of elemental composition. According to McKay et al. (1) at least four different generations of microbreccias are present. They found no systematic relationship among the various microbreccia clast types, observing that a given clast type may enclose a clast of another type, but in other cases this host-inclusion relationship is reversed. The unsystematic relationship of clast types in 66055 contrasts with the situation we found for breccia 14321 (2) which was recovered from the Fra Mauro Formation.

A total of 37 samples of breccia 66055 were analyzed by instrumental neutron activation techniques for 22 trace and major elements. They included samples of the matrix and of all clast types of which individuals large enough to be physically separated (1 mm or larger) were observed. Data for a few of the samples are presented in Table 1. Identification of the clast types should be considered tentative, because it is somewhat difficult to correlate lithologically our clast samples with types identified in thin sections.

All of the clasts belong to one of the compositional types described by Drake et al. (3) in their study of 2-4 mm lithic fragments from the Apollo 16 landing site. Petrographically the situation is not so clear-cut, partly because of a temporary lack of detailed data on our samples. Clasts of the ANT suite appear to correspond both petrographically and compositionally to either the low-K or K-rich ANT suite of Drake et al. Our partially molten microbreccias probably correspond most closely to poikiloblastic rocks. Assignments of our other clast types to specific rock types distinguished by Drake et al. are not convincing without additional major element and petrographic data, although in compositional terms a great many of them appear to correspond to their K-rich residual-mesostasis-bearing ANT rocks. Assignment of any clast we have analyzed to the spinel-troctolite type is not possible at present. Although the petrographic studies of McKay et al. confirm that troctolites are present as clasts in 66055, no spinel troctolites were noted. The presence of light-matrix breccia clasts (4) in 66055 cannot be confirmed either, although they may correspond to the unrecrystallized microbreccias of McKay et al.

## 66055- COMP. AFFINITIES

Fruchter, J. S. et al.

The matrix of 66055 appears to be simply a mixture of the various clast types which was formed by mutual abrasion. The low-K ANT composition dominates the majority of the matrix compositions.

It appears, therefore, that most if not all of the petrographic and certainly all of the compositional clast types found as lithic fragments in Apollo 16 soil are found intimately mixed in breccia 66055, thought to have been ejected from South Ray Crater. The absence of systematic relationships among the clasts compounds difficulties of determining stratigraphic affinities for the various clast types. It is obvious, however, that most if not all of the rock types now present at the Apollo 16 site were involved in the most recent stages of the rather thorough mixing process which led to the formation of 66055.

## REFERENCES

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## 66055- COMP. AFFINITIES

Fruchter, J. S. et al.

Table 1. Compositions of selected clasts and matrix of Breccia 66055

	1	2	3	4	5	6
%Fe	6.6	1.8	4.4	4.7	7.9	3.8
Sc	12.2	3.5	9.2	9.3	7.7	7.3
Cr	1154.0	378.0	834.0	793.0	680.0	733.0
Co	50.0	12.0	32.0	38.0	199.0	25.0
Hf	9.3	0.6	3.7	7.5	4.3	4.2
Th	4.8	0.5	2.0	3.7	3.1	2.3
Na	3840.0	2880.0	3585.0	3290.0	3320.0	3285.0
K	2150.0	315.0	830.0	1310.0	810.0	995.0
La	29.6	1.9	11.2	20.3	16.8	11.9
Ce	80.8	5.3	52.4	73.4	48.0	30.8
Sm	14.4	0.9	10.5	9.5	8.4	5.6
Eu	2.7	1.3	5.5	1.5	2.2	1.2
Lu	1.4	---	0.6	1.0	0.8	0.3
%Al	12.5	17.7	13.7	13.4	15.3	16.0

Abundances in ppm unless otherwise noted.

- 1: Average of remobilized matrix breccias
- 2: Average of ANT Suite Breccias
- 3: Average of Intermediate K-ANT breccias
- 4: Unassigned clast- brown, coarsely crystalline
- 5: Unassigned clast- yellowish-white
- 6: Average of matrix

Relative errors  $1 \sigma =$

- 1% Na
- 2% Sc, Co
- 3% Fe, Cr, Hf, La, Sm, Eu, Lu, Al
- 5% Th, Ce
- 10% K