

14053

Sample 14053 was collected at station C2 approximately 1.21 km ENE of LM and approximately 130 m south of the rim of Cone Crater. The area where the sample was collected is characterized by a 10-15° southward slope away from Cone Crater. The area is moderately covered by blocks ranging from the limit of resolution up to 2.5 m. The larger boulders are rounded while the smaller ones are more angular to rounded. Abundant small irregular craters (< 10 cm) are present in the general area of the sample locale. Very few distinct 15 to 30 cm craters are present. The whole area appears to be in the continuous ejecta blanket of Cone Crater. The sample was returned in documented bag 14N in ALSRC1006.

PHYSICAL CHARACTERISTICS

Mass	Dimensions
251.3 g	8.0 x 6.0 x 3.0 cm

The sample is slabby, with rectangular to rounded corners. One side has been freshly broken and unweathered. The exposed surface displays rounding and microcraters.

SURFACE FEATURES

The flat, relatively fresh surface is unpitted. The convex surface has gentle relief with some prominences of approximately 1-3 mm in height. These features are not abrupt but rounded. Pits appear on the convex surface but not on the flat surface. Pits are glass lined and have a size range from 0.5-3.0 mm. Average pit size is 1 to 2 mm. Density of pits is approximately 10 pits per square centimeter.

Cavities are both vesicular and vuggy. Irregular vugs range from 1-2 mm in size. Small vugs (0.5 mm diameter) and vesicles (1 mm in diameter) contain feldspar and orthopyroxene crystals.

There are three planar and four non-planar fractures appearing in two sets. Fractures have an irregular orientation. There are numerous hair-like cracks a few millimeters long. The entire fracture pattern is somewhat irregular.

There are fragments of what appears to be soil clinging to the B1 surface (NASA photo # S-75-33972).

PETROGRAPHIC DESCRIPTION

14053 is a holocrystalline, fine-grained, equigranular mare basalt. Approximately 30% of section 14053,6 consists of plagioclase laths, and the remainder is pyroxene. There are, as is seen in hand specimen, two types of pyroxene present. The higher value assigned to feldspar (60%) in hand specimen may be due to the inhomogeneous nature of the rock. In texture and mineral proportion this rock appears different from Apollo 11 and 12 basaltic rocks. There is abundant cristobalite (5-10%) and a small amount of olivine present in the thin section.

Upon close examination the rock appears to be inhomogeneous in hand specimen. Some areas display relative concentration of olivine and pyroxene. These inhomogenities are on a 1-2 cm scale.



S-75-33972



S-75-33971



1 mm

14053,6

DISCUSSION

Sample 14053 is listed as basalt by Wilshire and Jackson (1972) and by Quaide and Wrigley (1972) and as mare basalt by Simonds et al. (1977). Many, including Swann et al. (1977), believe that 14053 is a clast from a larger breccia boulder. Crystalline rocks are rare in the Apollo 14 collection. In a 1971 memo D. Morrison notes that fragments of soil clinging to the bottom may actually be the remnants of breccia matrix which once enclosed the rock.

Sample 14053 is described by Hubbard et al. (1972) as a mare-like basalt, with $\text{FeO} > 14\%$, but the Al_2O_3 concentration is more like that of KREEP basalts ($> 12\%$), making 14053 intermediate in composition. Sample 14053 also has low REE values, but an intermediate K/U ratio. Ridley (1975) concluded that the sources of aluminous mare basalts such as 14053 are not significantly different from the sources of the common mare basalts. He felt that slight chemical changes in the lunar mantle were more important in producing aluminous mare basalts than pressure.

Papanastassiou et al. (1971) determined the Rb-Sr age to be $3.96 \pm 0.04 \times 10^9$ years for sample 14053. The $^{38}\text{Ar}_{\text{sp}}/^{37}\text{Ar}$ thermal release patterns allowed Husain et al. (1972) to assign an exposure age of $21 \pm 5 \times 10^6$ years to sample 14053,34, while the age of formation is given by them as $3.92 \pm 0.08 \times 10^9$ years based on $^{40}\text{Ar}/^{39}\text{Ar}$ plateau. Age data also suggest that formation of aluminous mare basalts was not a unique event, but occurred over a 0.5 b.y. period. During this time the zone of incipient melting moved to progressively higher pressures, but the composition of aluminous mare basalts occupies a relatively narrow range, supporting Ridley's (1975) claim that the chemical changes in the heterogeneous mantle is the significant factor in aluminous basalt production.

Wenk et al. (1972) determined the average plagioclase composition to be $\text{An}_{91.3}$ in sample 14053 using thin sections 14053,11; 14053,19; and 14053,61. Czank et al. (1972) found An content of 14053,45 to be 89-94 using the U-stage, and 85-93 using index of refraction.

Ghose et al. (1972) studied clinopyroxenes of samples 14053,44. They found that the sample had been quenched quickly at a temperature higher than 1000°C . Morgan et al. (1972) indicate that 14053 has a low siderophile content (Au 0.11 ppb). Finger et al. (1972), on the basis of their pyroxene studies, concluded that the original cooling rate of sample 14053,116 must have been very slow, and that it had been reheated afterwards to a temperature greater than 840°C and then cooled down rapidly.