



Anorthosite

LUNAR SAMPLE DISK 8

ANORTHOSITE This white rock is composed of crystals of one mineral, feldspar. Rocks like this make up much of the Highlands of the Moon, where feldspar produces the light color. Shortly after material gathered together to form the Moon, the outer Moon melted. As the melt cooled, feldspar crystals formed and floated (like ice cubes in water) upward to form the Moon's crust. At first the feldspar crystals were pale gray or colorless. Then meteorites collided with the Moon and broke up its crust into fragments, and shocked and shattered the feldspar crystals so they are now white. The rusty, red grains on the sample are iron metal from the Moon which was reacted with water and oxygen on Earth. The black coated area on the rock is glass melted and splashed onto the rock by the impacts of small meteorites. The small circular pit on the rock surface was formed when a meteorite struck the rock blasting out material, and also melting some of it to line the resulting crater with glass.

The chip in this disk, which weighs about 1 gram, was removed from a 1185 gram (2.6 lbs.) rock, number 66095. Apollo 16 astronauts found the rock loose on the surface at the base of Stone Mountain in the Descartes region of the light colored highlands near the center of the Moon.

Gray matrix, composed of small rock fragments and glass, surrounding the larger fragments

Feldspar (clear, uncrushed)

Glass-lined crater produced by the impact of a small meteorite

Ilmenite (shiny, black flakes of iron-titanium oxide)

Large Anorthositic rock fragment

Pyroxene (orangish brown)

Olivine (yellow)

Breccia

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BRECCIA This rock is made of fragments of other rocks that were broken by collisions of meteorites with the Moon. The fragments were heated by the collisions that broke them apart, so that sharp edges melted and stuck to other grains to form a new rock, composed entirely of broken rocks and smaller mineral grains, called a breccia (breck'sha).

Breccias like this one were produced when the original crust of the Moon was completely broken up by meteorite impacts. Pieces of this crust now exist as rock fragments in these breccias, and for this reason many of the larger fragments (about 1 cm or 0.4 inches across) are subjects of intense study by several of the 100 scientists laboratories throughout the world working with the lunar samples. The black coated area on the rock is glass melted and splashed onto the rock by the impacts of small meteorites. The small circular pits on the rock surface were formed when meteorites struck the rock blasting out material, and also melting some of it to line the resulting craters with glass.

The chip in this disk weighs about 1 gram and was removed from rock number 14321, which weighed 8998 grams (19.8 lbs.). The Apollo 14 astronauts collected this football-size rock at the edge of Cone Crater, which is about 70 meters (230 ft.) deep. The rock was part of a buried layer of breccia and evidently was cast out of the crater when it was formed by a meteorite.

Feldspar
(clear)

Cavity formed
by gas as lava
crystallized

Olivine
(yellow)

Pyroxene
(reddish brown)

Ilmenite (shiny, black flakes
of iron-titanium oxide)

Basalt

BASALT:

A basalt forms when the lava that flows onto the surface of the Moon cools and crystalizes. The individual mineral grains are large enough to be seen under a microscope and consist mainly of pyroxene and feldspar, and lesser amounts of olivine and ilmenite (iron titanium oxide). (Examples are marked on the photograph of the chip). The individual crystals grew in the molten lava just like ice crystals grow as water freezes. Where gas pushed the still liquid part of the lava away to form cavities, the crystals could form their own distinctive shapes, as do snowflakes that grow in air.

Basalt lava flows are the dark materials that have filled the lowlands on the Moon's surface. These areas cover about half the Moon's face. Because they are smooth and have flooded the lowlands, each of these areas is called a mare or sea. They are surrounded by the lighter-colored, hilly and mountainous highlands. The dark areas that are circular are basins, produced by large meteorites. These basins have been filled by many basalt lava flows, from one of which the basalt in the disk came.

The three small chips in this disk, weighs about 1/2 gram and were removed from a large rock, which is numbered 15555 and weighed 9614 grams (21.3 lbs.). In August, 1971, the rock was collected by the Apollo 15 astronauts at the east edge of Mare Ibrum, the large circular area on the upper part of the Moon, just left of the center.