

# 10019

Sample 10009 is a rounded, medium dark grey, fine breccia. It originally weighed 297gm, and was 7 X 4 X 4 cm. This sample was returned in ALSRC #1004 (Documented Sample Container).

BINOCULAR DESCRIPTION BY: Twedell DATE: 9-8-75

ROCK TYPE: Fine breccia SAMPLE: 10019,31 WEIGHT: 29gm

COLOR: Medium dark grey DIMENSIONS: 3 x 2.5 x 2.5 cm.

SHAPE: Rounded; subangular to subrounded (PET)

COHERENCE: Intergranular – tough (coherent)  
Fracturing – few, non-penetrative

FABRIC/TEXTURE: Anisotropic/Fine breccia

VARIABILITY: Homogeneous

SURFACE: Smooth and rounded on pitted surfaces, irregular on fresh surfaces B<sub>1</sub> and W<sub>1</sub>. E<sub>1</sub> has been wire-sawed.

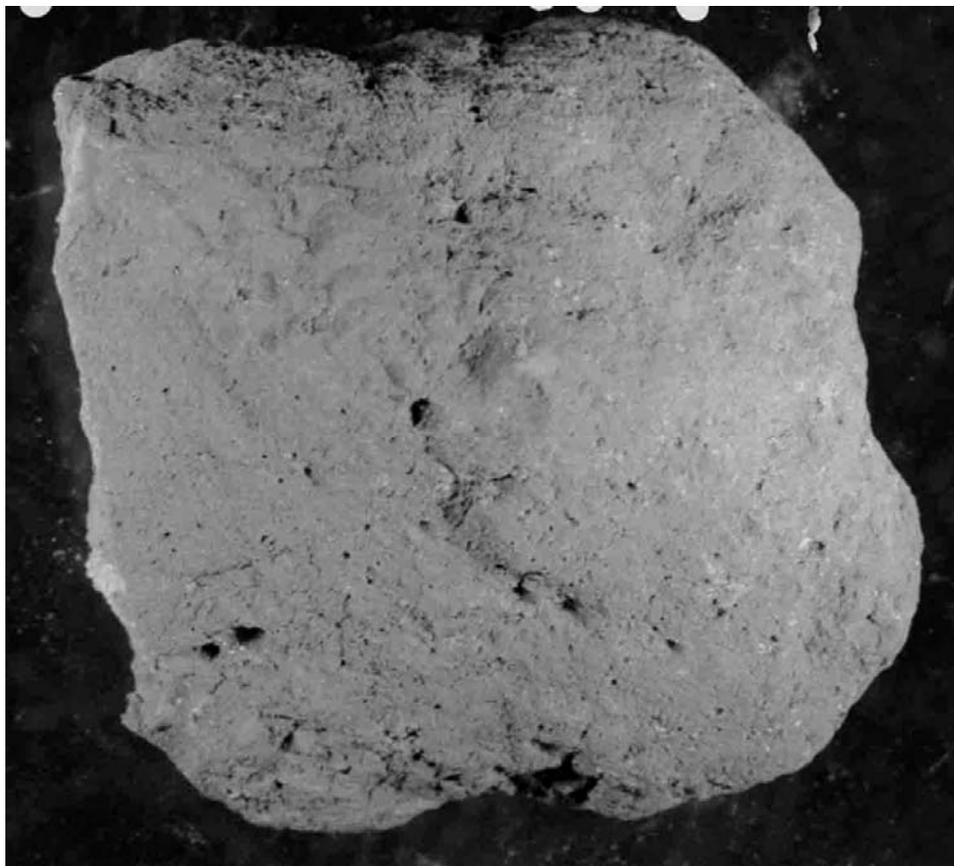
ZAP PITS: Many on S<sub>1</sub>. Few on T<sub>1</sub>, E<sub>1</sub>, N<sub>1</sub>. None on B<sub>1</sub>, W<sub>1</sub>. Pits are glass lined.

CAVITIES: None.

COMPONENT	COLOR	% OF ROCK	SHAPE	SIZE (MM) DOM.	RANGE
Basalt Clast <sub>1</sub>	Honey Brn & White	2	Rounded – subrounded	1.5	1-3
Salt & Pepper Clast	Blk. & White	1-2	Rounded – subrounded	2	1-5
White Clast	White	1	Irregular - subrounded	1	1-1.5
Matrix	Med.Dk.Grey	96	-----	-----	-----
Brown Clast <sub>2</sub>	Hon.Brown	1	Subangular	.5	1

- 1) Opaque material could be ilmenite
- 2) There are only a few of these clasts on the S<sub>1</sub> surface (See below)

SPECIAL FEATURE: This sample resembles 10066 in all components. Surface is sparsely covered with glassy spatter. Some glass on the surface is honey brown in color, with some small brown clasts (1mm) which have a crushed glass appearance.

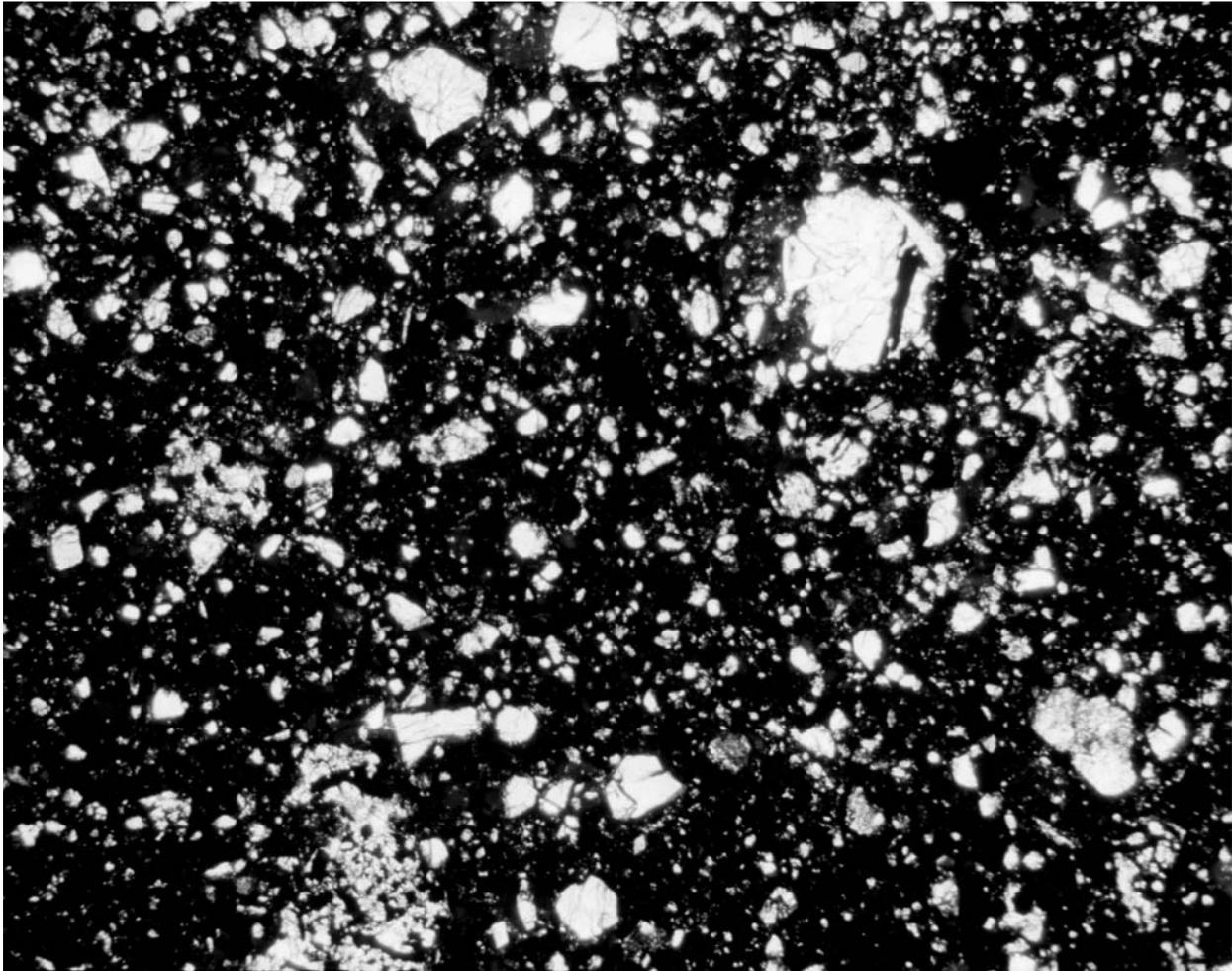


10019, 1 Original PET Photo (S-69-45977)



10019,1 (S-76-23357)

10019



S-76-26277 –SECTION: 10019,33                      Width of Field: 2.72mm plane light  
THIN SECTION DESCRIPTION    BY: Walton                      DATE: 6/22/76

SUMMARY: Partly devitrified typical breccia with a fairly low lithic clast content. The lithic clasts present are relatively small as compared to many of the other Apollo 11 breccias. The rock shows a number of strain characteristics.

Matrix 55% of Rock

<u>Phase</u>	<u>% Section</u>	<u>Shape</u>	<u>Size (mm)</u>	<u>Comments</u>
Dark Brown	100%		< 0.001	Glass-rich with many cryptocrystalline phases; some suggestion of minor flow

Mineral Clasts 30% Rock

<u>Phase</u>	<u>Relative Abundance</u>	<u>Shape</u>	<u>Size (mm)</u>
Clinopyroxene <sub>1</sub>	Very abundant	Equant to irregular	0.001-0.5
Plagioclase <sub>2</sub>	Abundant	Tabular to irregular	0.001-0.2
Opagues <sub>3</sub>	Few	Blocky to Skeletal	0.001-0.2

- 1) Most highly strained
- 2) Most show fair to good twin planes
- 3) Most in clasts, some shards in matrix

Lithic Clasts 17% of Rock

<u>Type</u>	<u>Relative Abundance</u>	<u>Shape</u>	<u>Size (mm)</u>
Small	Very abundant	Rounded to irregular	0.001-1.0
Large <sub>4</sub>	Two present	Rounded to irregular	>1.0
4)	a. Coarse-grained basalt consisting of large pyroxene crystals with high skeletal ilmenite crystals and subhedral plagioclase.		
	b. Coarse-grained basalt consisting of very narrow plagioclase tablets with large pyroxene crystals and minor ilmenite.		

Glass Clasts 5% of Rock

<u>Type</u>	<u>Relative Abundance</u>	<u>Shape</u>	<u>Size(mm)</u>
Yellow-orange <sub>5</sub>	Very abundant	Spherical to irregular	0.001-0.5
Colorless <sub>6</sub>	few	Spherical to irregular	0.001-0.2

- 5) Approximately half spherical masses-half angular; many dendritic crystals.
- 6) Mostly angular

Selected References: Keil et al. (1970)

HISTORY AND PRESENT STATUS OF SAMPLES – 6/22/76

10019 was removed from ALSRC #1004 and originally processed in the Vac Lab. It was one of the rocks in F-201 at the time of the glove rupture. Approximately 55 gm were sent to PCTL for PET analyses. The larger piece was, at one time, chipped and sawed in SPL. The remaining pristine samples were re-examined in SSPL.

PRISTINE SAMPLES: (All VAC-SPL-SSPL)

1	167.042 gm	Piece. Five surfaces are pitted, one is fresh. Ex-display piece.
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30	33.323 gm	Piece. One surface is pitted, the others are fresh. Ex-display piece.
31	29.55 gm	Piece. Four surfaces are pitted, two are fresh.
77	11.12 gm	Consisting of three large chips. One chip has patches of glassy spatter.
80	0.85 gm	Chips and fines.

RETURNED SAMPLES: NONE

CHEMICAL ANALYSES

Element	Number of Analyses	Mean	Units	Range
SiO <sub>2</sub>	16	42.46	PCT	9.98
Al <sub>2</sub> O <sub>3</sub>	14	10.71	PCT	5.63
TiO <sub>2</sub>	12	8.10	PCT	2.54
FeO	12	16.32	PCT	6.86
MnO	13	.265	PCT	0.11
MgO	11	6.48	PCT	2.46
CaO	15	14.06	PCT	8.24
Na <sub>2</sub> O	14	.527	PCT	0.58
K <sub>2</sub> O	7	.140	PCT	0.05
P <sub>2</sub> O <sub>5</sub>	1	.15	PCT	0
Li	1	13.14	PPM	0
Rb	2	3.35	PPM	0.9
Cs	1	0.23	PPM	0
Sr	1	166.4	PPM	0
Ba	2	242.5	PPM	15.0
Sc	3	63.03	PPM	3.10
V	2	56.5	PPM	13.0
Co	3	33.70	PPM	3.40

## CHEMICAL ANALYSES

<u>Element</u>	<u>Number of Analyses</u>	<u>Mean</u>	<u>Units</u>	<u>Range</u>
Ni	1	157.16	PPM	0
Y	1	91.00	PPM	0
Zr	3	478.3	PPM	125.0
Hf	3	11.63	PPM	2.90
La	3	14.91	PPM	1.20
Ce	3	55.66	PPM	8.00
Nd	1	42.0	PPM	0
Sm	3	12.98	PPM	2.25
Eu	3	16.32	PPM	6.86
Gd	1	20.5	PPM	0
Tb	2	3.24	PPM	1.13
Dy	2	18.00	PPM	0.1
Ho	3	5.5	PPM	0.9
Er	1	14.10	PPM	0
Yb	3	11.7	PPM	1.4
Lu	3	1.64	PPM	0.40
Th	2	2.40	PPM	1.00
U	3	0.427	PPM	0.13
I	1	0.073	PPM	0
In	1	5.20	PPB	0
Os	2	4.50	PPB	5.5
Pr	1	7.9	PPM	0
Tb	2	3.24	PPM	1.13
O	1	39.90	PCT	0

Analysts: Ehmann and Morgan (1970); Goles et al., (1970a); Goles et al., (1970b); Rose et al., (1970); Wakita et al., (1970); O'Hara (1974); Reed and Jovanovic (1970); Gopalan (1970); O'Kelly et al., (1970); Lovering and Butterfield (1970); Lovering and Hughes (1971).

No Age References