10017

Sample 10017 is a vesicular basalt which originally weighed 973gm, and measured 16 X 11 X 6 cm. The sample is described as being black and white on fresh surfaces to steel grey on sawed. Sample was returned in ALSRC #1004 (Documented Sample Container).

BINOCULAR DESCRIPTION BY: Kramer DATE: 8-1-75

ROCK TYPE: Vesicular basalt SAMPLE: 10017,15 WEIGHT: 197.4 gm

COLOR: Finely Salt and Pepper (fresh)
Steel Grey (sawed)

DIMENSIONS: 8 x 6 x 4.5 cm.

SHAPE: Sub-rounded

COHERENCE: Intergranular – coherent
Fracturing – Two large penetrative fractures parallel to E_1-W_1.
Slight non-penetrative fracturing parallel to T_1-B_1.

FABRIC/TEXTURE: Isotropic/Equigranular

VARIABILITY: There is some difference in relative abundances of the various mineral components from place to place within the sample.

SURFACE: Irregular (both fresh and exposed)

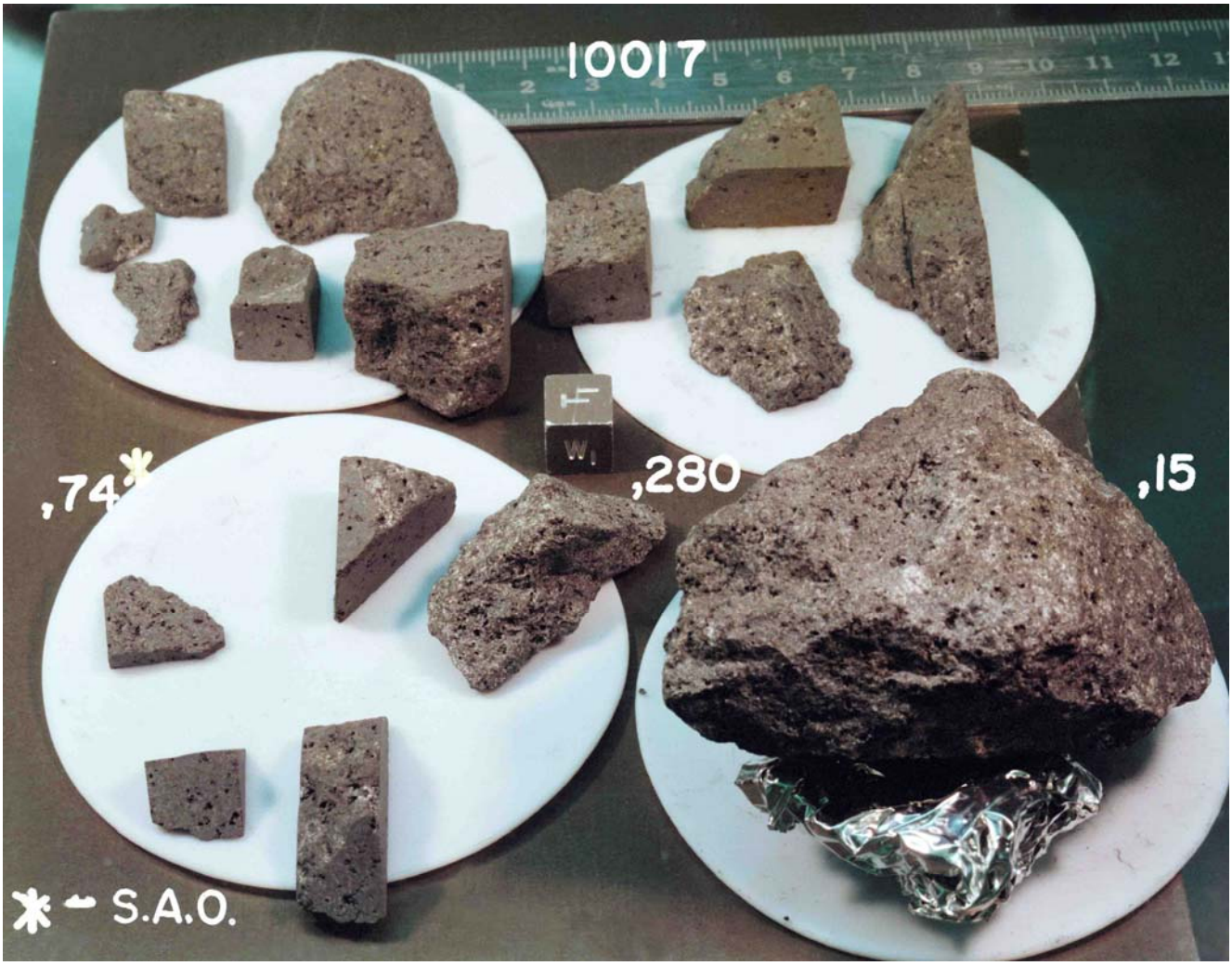
ZAP PITS: Few on E_1, S_1; 1-3mm diameter (PET)

CAVITIES: 15-20% of fresh surface covered by small (<2mm) vugs. The vugs are glass-lined and approximately 1/3 are irregular in shape.

COMPONENT	COLOR	% OF ROCK	SHAPE	SIZE (MM) DOM.	RANGE
Pyroxene[1]	Light Honey Yellow	40	Equant	.2	.01-.3
Plagioclase	Milky Way	40	Lathlike	.6	.2-.8
Ilmenite	Black	15	Equant	.2	.1-.4
Mesostasis[2]	Black	5	----------	----------	

1) Difficult to distinguish from plagioclase on color.
2) Difficult to distinguish from fine-grained ilmenite.

10017,0
Original PET Photo (S-69-47560)



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(S-75-30209) *S.A.O.: Sample Arbitrary Orientation

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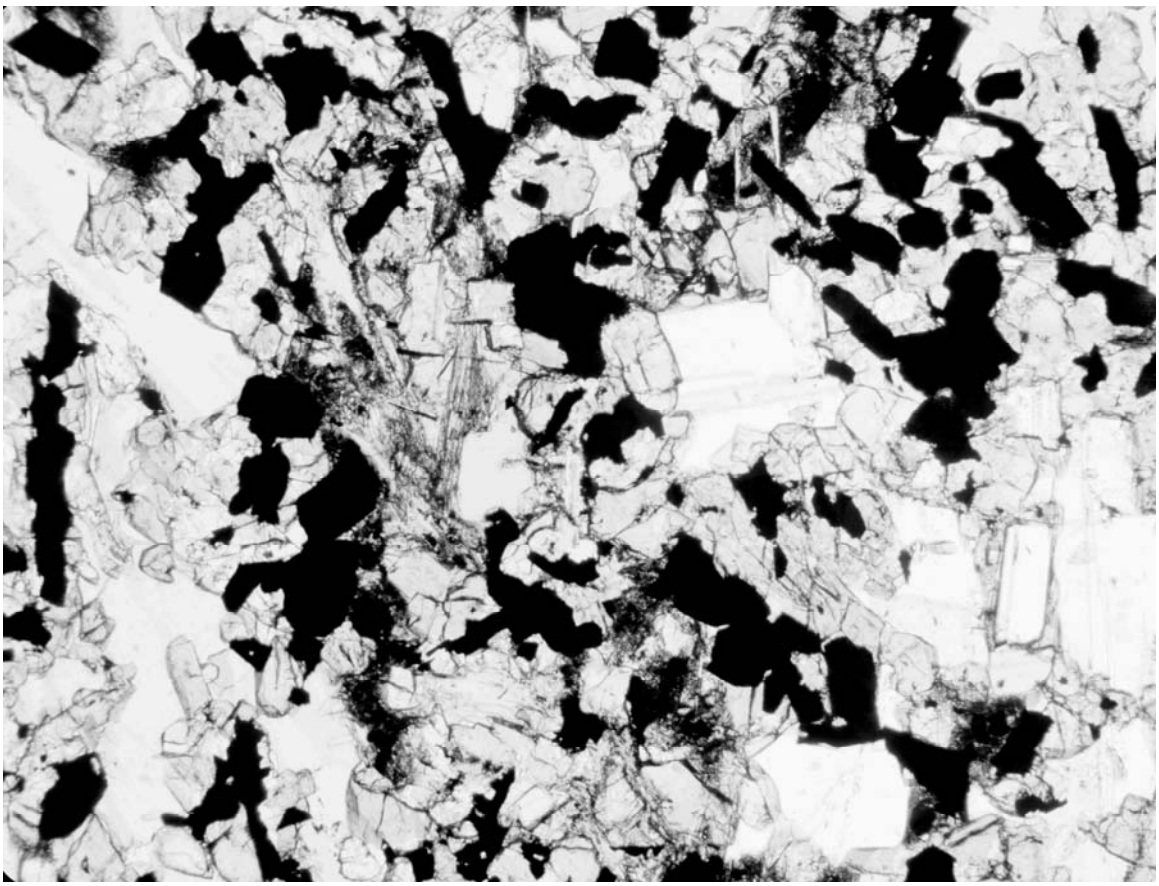

S-76-26302- SECTION: 10017,82 Width of Field: 2.22mm plane light

THIN SECTION DESCRIPTION BY: Walton DATE: 6/19/75

SECTION: 10017,82

SUMMARY: Fine-grained, poikilitic, vesicular basalt composed of clinopyroxene, plagioclase, two generations of ilmenite and subordinate opaques and mesostasis. The pyroxene and ilmenite crystals are much finer than the crystals of the plagioclase. The majority of all the crystals are anhedral. Some preferred orientation in the plagioclase crystals is present.

Phase	% Section	Shape	Size (mm)
Pyrox	44	Subhedral to anhedral	0.04-0.12
Plag	24	Tabular to anhedral	0.2-2.0
Opaq	24	Subhedral to anhedral	0.03-0.1
Meso	8	Irregular	----------

COMMENTS:

Pyroxene – Pale brown to nearly clear anhedral crystals of clinopyroxene surround the large plagioclase crystals. Some smaller euhedral crystals are found within a few of the crystals of plagioclase. Some zoning is present, but it is not pronounced. Some small subhedral crystals exhibit clear cleavage traces, simple twinning, and appear to have formed at a different stage of crystallization from the majority of the clinopyroxene.

Plagioclase – Small tabular crystals of plagioclase form distinct groupings, while the majority of the plagioclase, in the section, forms anhedral crystals in the interstercies formed by the pyroxene-ilmenite network. Twinning in the crystals is common and pronounced.

Opaques – Two generations of ilmenite occur in the section. The first forms small lath-like to skeletal lath-like crystals. The second type forms large, blocky, anhedral crystals which have a sieve texture and many re-entrants which are filled by the two silicate minerals.

Isolated masses of troilite and troilite with iron-nickel are found throughout this \ section. Some are associated near ilmenite crystals while others are isolated along the boundaries between the silicate phases. Occasional iron-nickel vein fillings are observed in the fractures within the silicates.

Mesostasis – Isolated irregular masses of a glass-rich phase occupy boundary voids between adjacent silicate phases. The size of the masses are from 0.05 to 0.1mm. The masses are very turbid and distinct crystals were not observed.

B.M. French et al., (1970) have described 10017,16 in some detail. Their modal analysis was: Clinopyroxene, 49.7%; plagioclase, 18.0%; ilmenite, 23.9%; and, mesostasis, 8.3%; which is in good agreement with the above analysis.

TEXTURE: The rock consists of a random network of intergrown clinopyroxene and ilmenite crystals. Plagioclase and glassy mesostasis occur and ilmenite crystals. Plagioclase and glassy mesostasis occur interstitial to the pyroxene-ilmenite network. The overall texture is poikilitic. The plagioclase crystals display a moderate alignment suggesting flow within the crystallizing lava. Vesicles are rimmed by small clinopyroxene crystals. Sharp boundaries occur between all phases except the mesostasis.

Selected References: Adler et al. (1970), Brown et al. (1970), Dence et al. (1970), French et al. (1970), Kushiro and Nakamura (1970), Mason and Wilson (1970), Reid et al. (1970).

HISTORY AND PRESENT STATUS OF SAMPLES – 10/12/76

10017 was removed from ALSRC #1004 and processed in the Vac Lab. It was one of the samples in F-201 at the time of the glove rupture. A 400 gm piece was sent to PCTL for analyses. A portion of this rock (subsample number unknown) was sawed in SPL. All remaining pristine subsamples were re-examined in SSPL.

PRISTINE SAMPLES

15	197.46 gms	Largest piece. Three surfaces are lunar exposed with pits and patina. All other surfaces are fresh. VAC-SSPL
74	105.93 gms	14 sawed chips. Many have 3-5 sawed surfaces. 11 of them have one lunar exposed surface. VAC-PCTL-SPL-SSPL
81	91.0 gms	1 piece pitted on N_1T face. All others fresh and dust free. Ex-display sample. VAC-SSPL
85	12.54 gms	Chips and fines. Several medium (c.25gm) chips, many with patina and pits. VAC-SSPL
88	1.41 gms	Chips and fines. Largest chips are 3-5mm, some with lunar exposed surfaces. VAC-SSPL
96	6.84 gms	Small chips and fines representative of sample. VAC-SSPL
280	13.07 gms	Chip. Split form subsample 15. One lunar exposed surface. All others are fresh. VAC-SSPL
281	6.66 gms	Chips and fines. Split from subsample 15. Two large (>1 gram) chips with lunar exposed surface. VAC-SSPL
282	0.12 gms	Small fresh chips and fines. Subsamples 89 and 90 were combined to make up this subsample. VAC-SSPL
283	1.59 gms	Small chips and fines. Split from subsample 74. No exposed surfaces. VAC-PCTL-SPL-SSPL

RETURNED SAMPLES:

50	5.05 gms	Chip. One sawed, two pitted and three fresh surfaces.
64	11.09 gms	Chip. Six sawed surfaces. 3 X 1 X 1 cm.
76	7.00 gms	Chips and fines. Largest chip is 2 X 2 X 0.5 cm. with two sawed, two pitted and two fresh faces.
159	8.23 gms	Chip. One fresh surface, all others are patinated. Pits are few.
180	13.23 gms	Chip. 1.5 X 1.5 X 2cm. Six sawed surfaces. Impregnated with epoxy.

CHEMICAL ANALYSES

Element	Number of Analyses	Mean	Units	Range
SiO_2	6	41.34	PCT	3.33
Al_2O_3	7	7.85	PCT	.907
TiO_2	7	11.68	PCT	2.5
FeO	7	19.55	PCT	5.21
MnO	7	.235	PCT	0.089
MgO	5	7.76	PCT	.448
CaO	6	10.74	PCT	1.19
Na_2O	9	.490	PCT	0.050
K_2O	13	.290	PCT	0.089
P_2O_5	3	.167	PCT	.02
H	1	.47	PPM	0
Li	6	19.35	PPM	6.7
Rb	12	5.66	PPM	2.4
Cs	5	.154	PPM	.066
Sr	9	157.72	PPM	74.8
Ba	10	261.39	PPM	150
Sc	5	80.26	PPM	25.5
V	4	66.62	PPM	54.0

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Element	Number of Analyses	Mean	Units	Range
Cr_2O_3	5	.354	PCT	.073
Co	7	30.7	PPM	20.5
Ni	2	36.26	PPM	47.54
Cu	3	10.10	PPM	4.8
Zn	2	33	PPM	30.0
Y	4	168.75	PPM	25.0
Zr	4	695	PPM	965
Nb	1	27.4	PPM	0
Pd	1	.001	PPM	0
Ag	1	.016	PPM	0
Cd	2	.056	PPM	0.024
Ta	3	2.8	PPM	3.8
W	1	0.4	PPM	0
Hf	4	17.72	PPM	12.5
Os	1	.22	PPM	0
Ir	1	.001	PPM	0
Au	2	.004	PPM	0.007
Hg	1	.013	PPM	0
La	4	24.95	PPM	5.6
Ce	5	75.98	PPM	20.0
Pr	2	10.10	PPM	5.6
Nd	4	64.40	PPM	16
Sm	6	22.11	PPM	6.1
Eu	6	2.24	PPM	0.86
Gd	4	19.45	PPM	11
Tb	4	4.49	PPM	1.62
Dy	5	29.34	PPM	17
Ho	3	6.17	PPM	4.5
Er	4	18.27	PPM	8
Tm	1	3.0	PPM	0

Element	Number of Analyses	Mean	Units	Range
Yb	6	17.85	PPM	6.5
Lu	6	2.98	PPM	2.88
Th	9	3.70	PPM	2.45
U	9	0.698	PPM	0.65
B	1	0.7	PPM	0
Ga	3	4.43	PPM	1.10
In	3	0.70	PPM	0.137
Tl	1	0.006	PPM	0
C	1	100	PPM	0
Ge	1	1.0	PPM	0
Pb	2	1.62	PPM	0.113
Bi	1	0.001	PPM	0
O	1	40.7	PCT	0
S	3	0.22	PCT	0.2
Se	1	0.215	PPM	0
Te	1	0.117	PPM	0
F	2	164.5	PPM	173
Cl	3	13.43	PPM	2.8
Br	3	0.155	PPM	0.12
I	2	0.242	PPM	.475

Analysts: Compston et al., (1970); Goles et al., (1970); Maxwell et al., (1970); Wakita et al., (1970); Wanke et al., (1970); Willis et al., (1972); Gast et al., (1970); Gibson & Johnson (1971); Marti et al., (1970); Murthy et al., (1970); O'Kelly et al., (1970); Perkins et al., (1970); Philpotts & Schnetzler, (1970); Tera et al., (1970); Reed & Jovanovic, (1970); Reed & Jovanovic, (1971); Anders et al., (1971); Papanastassiou et al., (1970); Eberhardt et al., (1971); Shedlovsky et al., (1970); Goles, (1970); Silver, (1970); Tatsumoto, (1970).

Age References: D'Amico et al., (1970); Turner (1970); Hintenberger et al., (1971); Armstrong & Alsmiller, (1971); O'Kelly et al., (1970); Bochsler et al., (1971a); Marti et al., (1970); Perkins et al., (1970); Eberhardt et al., (1974); Silver (1970); Tatsumoto (1970); Papanastassiou (1970); Papanastassiou et al., (1971); Crozaz et al., (1970).