10047

Sample 10047 is an angular, pinkish grey, Cristobalite Basalt. This sample originally weighed 138gm, and measured 6.5X4X3.5 cm. It was returned in ALSRC container #1003 (Bulk Sample Container).

BINOCULAR DESCRIPTION BY: Kramer DATE: 6-14-76

ROCK TYPE: Cristobalite Basalt SAMPLE: 10047,58 WEIGHT: 19.44 gm

COLOR: Pinkish Grey DIMENSIONS: 3 x 2 x 1.5 cm

SHAPE: Angular

COHERENCE: Intergranular – coherent
Fracturing – few, non-penetrative

FABRIC/TEXTURE: Isotropic/Equigranular

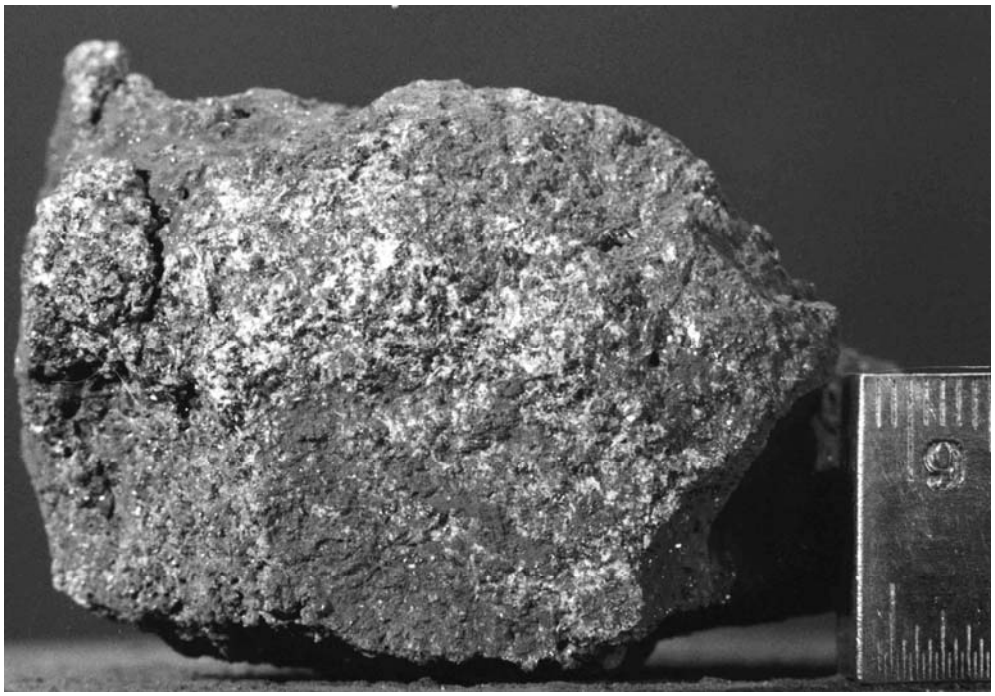
VARIABILITY: Homogeneous

SURFACE: Granulated

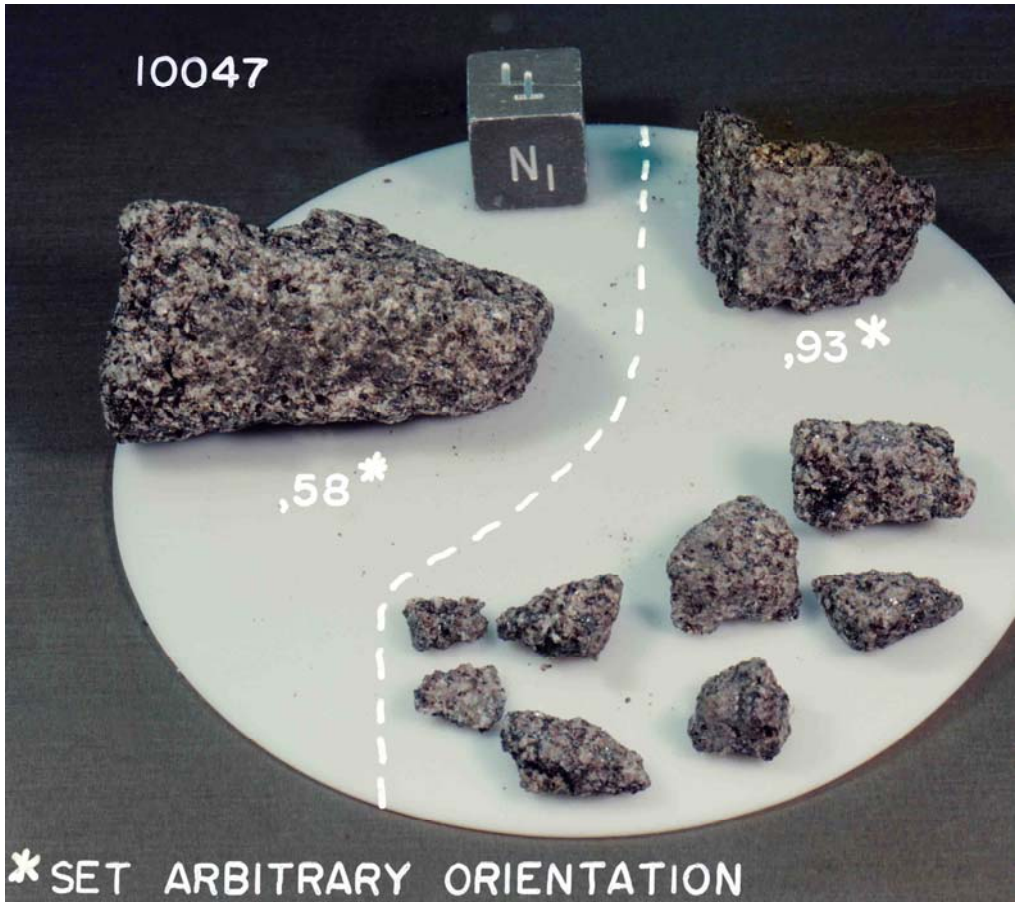
ZAP PITS: T_1, few. Others – none.

CAVITIES: Absent; irregular shaped vugs up to several mm in size are common. Freshly broken surface shows no vugs (PET).

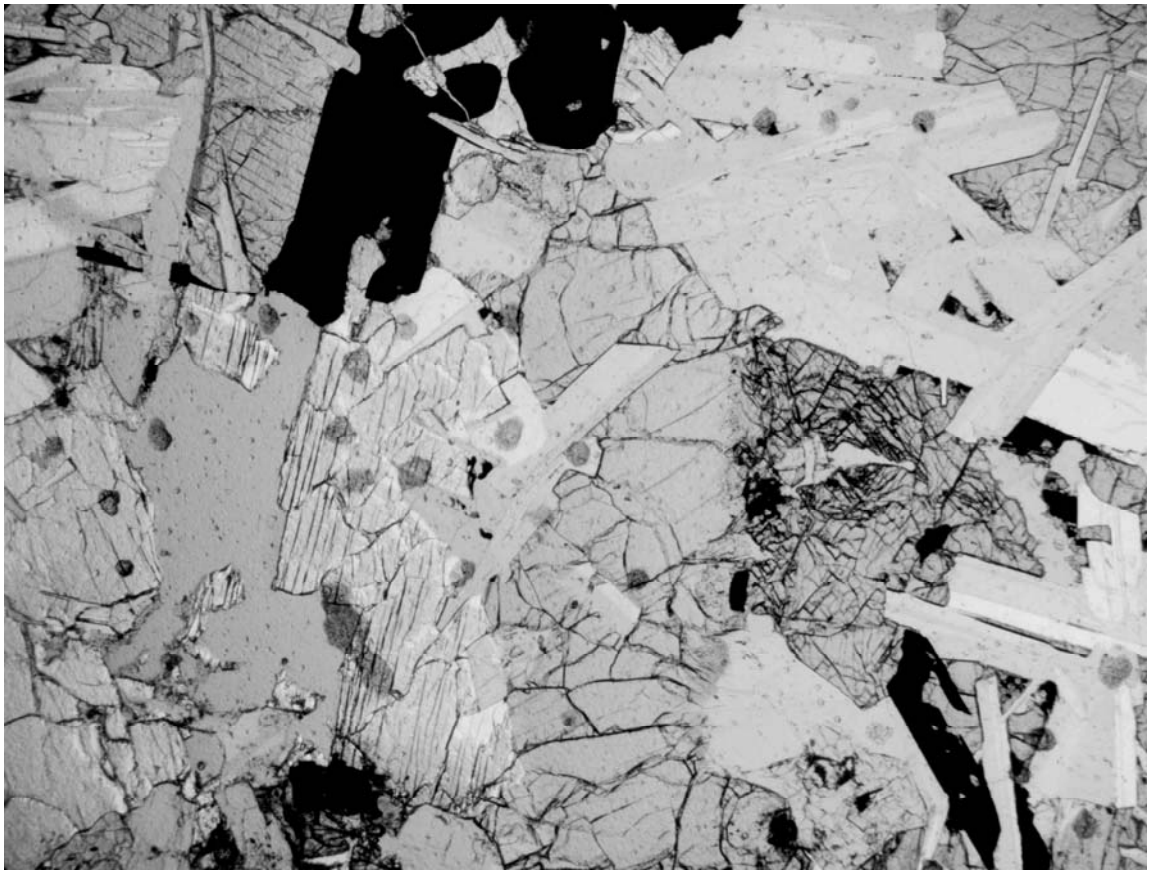
COMPONENT	COLOR	% OF ROCK	SHAPE	SIZE (MM) DOM.	RANGE
Olivine	Green	<3	Equant	0.8	0.5-1.0
Pyroxene	Brown	>50	Equant	0.2	0.1-0.25
Plagioclase	Milky	<40	Lathlike	0.2	0.1-0.3
Ilmenite	Metallic	10-15	Platy	0.2	0.02-0.6



10047,0 Original PET Photo (S-69-45632)



10047 (S-75-26511)



S-76-26298.

SECTION: 10047,47 Width of Field: 2.22 mm plane light

THIN SECTION DESCRIPTION BY: Walton DATE: 6/11/76

SUMMARY: Medium-grained subophitic basalt composed of clinopyroxene, two generations of plagioclase, ilmenite with subordinate cristobalite, pyroxferroite and mesostasis. Large anhedral crystals of clinopyroxene host the other phases present. Many of the pyroxene crystals are polygranular while appearing as a single crystal in plane polarized light.

Many of the plagioclase, ilmenite and cristobalite crystals show parallel facial development. The ilmenite crystals are highly skeletal.

Phase	% Section	Shape	Size (mm)
Pyrox	48	Anhedral to irregular	0.1-2.5
Plag	35	Euhedral to anhedral	0.05-0.0
Cris	7	Anhedral	0.1-0.9
Opaq	9	Subhedral to skeletal	0.9-2.5
Meso	1	----------	0.001-0.13

COMMENTS:

Pyroxene – The clinopyroxene forms large pinkish tan anhedral crystals. Many of the crystals have been granulated while retaining the monocrystalline appearance. These crystals form the host medium for all other phases present.

The extinctions are, for the most part, poor with few grains giving sharp extinction points. Almost all crystals show a pronounced fracture pattern with minor cleavage parting developed. A few crystals show a well developed cleavage pattern.

Small crystals of pyroxferroite are associated as overgrowths on the pyroxene crystals. These crystals form sharp contacts with the pyroxene. Many of the fractures in the pyroxene continue through the adjacent pyroxferroite overgrowth. The pyroxferroite masses are scattered throughout the section and no localized concentration was noted.

Plagioclase – Two generations of plagioclase occur in the rock. The first type is euhedral tablets which appear in the section as equant to acicular crystals. The crystals show well developed twin planes and extinctions are sharp. There appears to be a preferred orientation to the crystals yet there is only minor clustering.

The second type of crystals represented in the rock forms interstitial masses between the pyroxene-ilmenite-plagioclase network. The masses are larger than the euhedral crystals and show poorer twin planes and extinctions are patchy. This later formed plagioclase is most often associated with the mesostasis that occurs in the rock. The mesostasis is light brown in color and very turbid.

Cristobalite – A relatively large amount of cristobalite occurs in this section. Chao et al. (1970) found 4.5% in another section of this rock. This section may, therefore, be atypical. The anhedral masses are all as interstitial fillings between other crystalline phases.

Opaques – As is usual for Apollo 11 basalts, the most common opaque mineral present in the rock is ilmenite. The crystals from subhedral to skeletal masses scattered throughout the rock. The subhedral crystals are associated with plagioclase and cristobalite while skeletal crystals form in the plagioclase-pyroxene network.

Small masses of troilite and troilite with iron-nickel inclusions are also present. These form only a very small percentage of the opaque phases present. Most of the masses occur with or near the ilmenite crystals.

TEXTURE: Subophitic medium-grained basalt consisting of pyroxene, two generations of plagioclase, ilmenite, and cristobalite with minor other phases. Only moderate shock effects are evident in the section. Contacts are sharp and little to no interaction between phases was noted.

Selected References: Chao et al., (1970), Dence et al. (1970), Essene et al. (1970), Lovering and Ware (1970), Ross et al., (1970).

HISTORY AND PRESENT STATUS OF SAMPLES – 10/29/76

10047 was removed from the Bulk Sample Container (ALSRC #1003), split and organically contaminated in the Bio-Prep Lab. A 6gm chip was sent to PCTL for PET analysis. During re-examination in SSPL, this sample (10047,1) was found to be mislabeled. A mix-up occurred in PCTL on 8-15-69. 10044,1; 10045,1; and 10047,1 is actually 10045,1.

PRISTINE SAMPLES

58	19.44 gm	Piece. Two surfaces show patina, but no pits. All other surfaces are fresh.
59	8.78 gm	Bandsaw fines.
60	0.11 gm	Fines.
93	10.20 gm	Nine chips. Five are fresh, two have one sawed surface each. Two have patinated surfaces.
94	8.44 gm	Chips and fines.
171	0.19 gm	Dust.

RETURNED SAMPLES:

27	10.97 gm	Chip. One patinated surface.
54	11.07 gm	Chips and fines. Two chips have sawed surface. Many have pitted surfaces.
56	6.08 gm	Chip. All surfaces are fresh.

CHEMICAL ANALYSES

Element	Number of Analyses	Mean	Units	Range
SiO_2	4	42.92	PCT	3.94
Al_2O_3	6	10.05	PCT	1.32
TiO_2	6	9.69	PCT	2.34
FeO	4	19.59	PCT	1.84
MnO	4	0.291	PCT	0.050
MgO	4	5.84	PCT	.43
CaO	5	11.99	PCT	2.73
Na_2O	5	.444	PCT	0.051
K_2O	4	.096	PCT	0.039
P_2O_5	1	.11	PCT	0
Li	1	16.31	PPM	0
Rb	4	1.129	PPM	0.61
Cs	2	0.052	PPM	0.015
Sr	3	198.9	PPM	15.7
Ba	2	179.0	PPM	182.0
Sc	2	98.5	PPM	13.0

Element	Number of Analyses	Mean	Units	Range
V	3	47.0	PPM	52
Cr_2O_3	4	0.204	PCT	0.055
Co	5	14.32	PPM	5
Ni	1	20.04	PPM	0
Cu	1	16.00	PPM	0
Zn	2	7.4	PPM	11.2
Y	1	134.0	PPM	0
Zr	2	384.5	PPM	101
Nb	1	23	PPM	0
Pd	1	0.002	PPM	0
Ag	1	1.89	PPB	0
Cd	1	3.40	PPB	0
Ta	1	2.6	PPM	0
Hf	2	14.35	PPM	2.3
Re	1	0.020	PPB	0
Os	1	0.260	PPB	0
Ir	1	0.005	PPB	0
Au	1	0.029	PPB	0
La	3	13.77	PPM	10.0
Ce	2	47.0	PPM	2.0
Pr	1	13.0	PPM	0
Nd	1	36	PPM	0
Sm	2	18.53	PPM	0.75
Eu	2	2.63	PPM	0.16
Tb	1	4.1	PPM	0
Ho	1	7.9	PPM	0
Yb	2	18.1	PPM	0.2
Lu	2	2.59	PPM	0.58
Th	3	1.11	PPM	1.4
U	2	0.192	PPM	0.064
Ga	1	4.0	PPM	0
In	1	2.80	PPB	0
Tl	1	0.28	PPB	0
Pb	1	0.769	PPM	0
Bi	1	0.16	PPB	0
O	1	40.10	PCT	0
S	1	0.18	PCT	0
Se	1	0.25	PPM	0
Te	1	0.013	PPM	0
F	1	193.0	PPM	0
Cl	1	14.4	PPM	0
Br	2	0.18	PPM	0.301
I	1	0.016	PPM	0

Analysts: Compston et al., (1970); Ehmann & Morgan, (1970); Rose et al.,(1970); Wakita et al., (1970); Ganapathy et al., (1970); Goles et al., (1970); Gopalon et al., (1970); Reed & Jovanovic, (1970); Hurley & Pinson, (1970); Anders et al., (1971); Lovering & Butterfield, (1970); Silver, (1970); Wakita et al., (1970).

Age References: Stettler et al., (1974); Boschler, (1971b); Marti et al., (1970); Eberhardt et al., (1971b); Silver, (1970); Crozaz et al., (1970).