

10003

Sample 10003 is a Cristobalite Basalt which originally weighed 213 gm, and measured 7X4.5X3.5 cm. Its shape was originally described by PET as subangular to blocky, with its color being light brown to "salt and pepper". Sample was returned in the Documented Sample ALSRC (#1004).

BINOCULAR DESCRIPTION BY: Kramer DATE: 6/09/76
ROCK TYPE: Cristobalite basalt SAMPLE: 10003,12 WEIGHT: 19.5 gm
COLOR: Light brown to salt & pepper DIMENSIONS: 3 X 2 X 1.5 cm
SHAPE: Subrounded
COHERENCE: Intergranular – coherent Fracturing – absent
FABRIC/TEXTURE: Isotropic/Equigranular
VARIABILITY: Homogeneous
SURFACE: Slightly granulated; splattered with various glasses and covered with pits (PET).
ZAP PITS: Few; size range of 1mm (PET)
CAVITIES: 5% of surface covered with vugs. Many are lined with plagioclase.

<u>COMPONENT</u>	<u>COLOR</u>	<u>% OF ROCK</u>	<u>SHAPE</u>	<u>SIZE (MM)</u> <u>DOM. RANGE</u>	
Pyroxene ₁	Resinous brown to black	50	Equant	0.3	0.1-0.5
Plagioclase ₂	Milky	40	Lathlike	0.3	0.1-0.5
Ilmentie ₃	Metallic black	10	Variable	0.2	0.05-0.3

- 1) Two types; amber and dark brown (approximately 50-50 distribution)
- 2) Dominant in vugs identified by cleavage and luster



10003,0 (S-69-45193)



10003,25 (S-76-25546)



10003, 49 S-75-30940

SECTION 10003,49 Width of field: 1.39 mm plane light

THIN SECTION DESCRIPTION BY: Walton DATE: 6/09/76

SUMMARY: Medium-grained subophitic basalt composed of clinopyroxene, two generations of plagioclase, ilmenite with subordinate cristobalite and mesostasis. Large subhedral to anhedral crystals of clinopyroxene form an interlocking network with euhedral tablets of plagioclase and subhedral ilmenite. Many of the ilmenite crystals are somewhat skeletal in their development.

<u>PHASE</u>	<u>% OF SECTION</u>	<u>SHAPE</u>	<u>SIZE(MM)</u>
Pyrox	44	Subhedral to anhedral	0.2-0.3
Plag	30	Euhedral to anhedral	0.01-0.1
Opaq	20	Subhedral to skeletal	0.02-0.15
Cris	3	Anhedral	0.1-0.5
Meso	3	Irregular	0.001-0.1

COMMENTS:

Pyroxene – The clinopyroxene forms large light brown subhedral to anhedral crystals. The crystals form an almost continuous interlocking array with the other phases present as interstitial members or as part of the array. Many of the crystals show some reaction has taken place between phases. Many of the crystals are zoned and have uneven extinctions.

A well-developed cleavage pattern is present in many crystals. A few crystals show simple twinning. More than one type of pyroxene may be present in the rock.

Plagioclase – Two distinct types of plagioclase occur in the rock. The first type occurs as euhedral tablets which appear as rectangular sharp crystals in the section. Twinning is sharp and the crystal outline is well defined.

The second types of crystals formed are larger ill-defined anhedral masses which form interstitially to the crystalline phases. The twinning is poorly defined and extinctions are irregular.

Many of the first type are grouped into somewhat radiating masses within the rock. These groups are somewhat isolated in the pyroxene array and tend to form localized concentrations.

Opakes – The crystals of ilmenite in the rock form subhedral to almost euhedral crystals with some skeletal development. Many crystals have several discernable forms present in the same crystal. Many crystals have rutile and chromite exsolution. A majority of the crystals are more or less equant. Small rounded masses of armalcolite are present in a few crystals.

Small rounded masses of troilite and troilite with iron-nickel are also present in the rock. These masses are randomly scattered throughout the rock.

Cristobalite – Small anhedral masses of cristobalite occur as interstitial masses in the crystalline network. It, together with the brown glass-rich mesostasis and the anhedral plagioclase form all the void filling phases.

TEXTURE: Medium-grained subophitic basalt consisting of an interlocking network of subhedral pyroxene, small euhedral tablets of plagioclase and subhedral ilmenite crystals. Large anhedral plagioclase crystals, anhedral cristobalite and masses of mesostasis occur interstitially to the crystalline network. Troilite masses occur both as inclusions in the pyroxene and associated with the mesostasis.

Selected References: Ross et al. (1970), Haggerty et al. (1970).

HISTORY AND PRESENT STATUS OF SAMPLES – 10/4/76

10003 was the first rock removed from the bulk sample box in the vacuum laboratory. It was sent for gamma-ray counting almost immediately, returned to Vacuum Lab and chipped for PET. It was sawed and chipped in SPL for allocation.

PRISTINE SAMPLES (all VAC-RCL-VAC-SPL-SSPL)

9	9.33	gm	Chip. One sawed surface. One surface with ½ cm ² glassy spatter. All others appear fresh.
12	19.55	gm	Chip. One lunar exposed surface. All others appear fresh.
25	117.00	gm	Piece. Pitted on T, N. Patina on W face. All others fresh. 5.4 X 3 X 4.4 cm.
134	1.22	gm	Chips and fines. Largest chip is 1 cm.
135	3.70	gm	3 chips. Largest two have two lunar exposed surfaces each. Smallest chip is fresh.
136	0.11	gm	Chips and fines.

RETURNED SAMPLES

384.544	gm	1 large (2 X 1.5 X 1.5cm) chip with four sawed faces plus two smaller chips. No pits observed.	
74	5.39	gm	Chip. Three sawed faces. No pits. 1.7 X 1.5 X 1.5cm.
119	3.234	gm	Chip. 1.3 X 1.2 X 1 cm. Two sawed faces. No pits.

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CHEMICAL ANALYSES

Element	Number of Analyses	Mean	Units	Range
SiO ₂	3	38.62	PCT	1.96
Al ₂ O ₃	4	10.32	PCT	1.36
TiO ₂	3	11.45	PCT	1.5
FeO	3	19.76	PCT	0.12
MnO	4	.29	PCT	0.108
MgO	3	7.33	PCT	1.43
CaO	3	11.25	PCT	0.61
Na ₂ O	4	.510	PCT	0.486
K ₂ O	8	.054	PCT	0.10
P ₂ O ₅	1	.12	PCT	0
Li	1	9.0	PPM	0
Rb	3	.710	PPM	0.5
Cs	1	.022	PPM	0
Be	1	1.5	PPM	0
Sr	3	153.97	PPM	9.2
Ba	3	162.0	PPM	114
Sc	2	84.0	PPM	20.0
V	2	72.5	PPM	19
Cr ₂ O ₃	3	.25	PCT	0.069
Co	2	14.55	PPM	0.9
Ni	1	2.70	PPM	0

Element	Number of Analyses	Mean	Units	Range
Cu	1	6.7	PPM	0
Y	2	112.5	PPM	1.0
Zr	3	416.33	PPM	251
Nb	1	21.0	PPM	0
Hf	1	11.6	PPM	0
La	4	14.32	PPM	1.5
Ce	3	41.27	PPM	8.5
Nd	2	40.4	PPM	4.2
Sm	3	13.37	PPM	1.0
Eu	3	1.80	PPM	0.08
Gd	2	18.0	PPM	2.0
Tb	2	3.38	PPM	0.24
Dy	2	22.0	PPM	0.8
Ho	2	3.85	PPM	0.3
Er	2	12.7	PPM	1.4
Yb	3	13.4	PPM	3.4
Lu	3	1.77	PPM	1.62
Th	5	1.01	PPM	0.2
U	5	0.27	PPM	0.06
Ga	1	4.7	PPM	0
Pb	1	0.495	PPM	0
O	1	38.1	PPM	0
S	1	0.18	PPM	0

Analysts: Compston et al., (1970); Ehmann & Morgan, (1970); Rose et al., (1970); Goles et al., (1970); Annell & Helz, (1970); Gast et al., (1970); O'Kelly et al., (1970); Perkins et al., (1970); Bochsler et al., (1971); Eberhardt et al., (1971); Stettler et al., (1974); Haskin et al., (1970); Tatsumoto (1970); Wrigley & Quaide, (1970).

Age References: Eberhardt et al., (1971b); Turner (1970); Hintenberger et al., (1971); Stettler et al., (1974); O'Kelly et al., (1970); Bochsler et al., (1971b); Perkins et al., (1970); Tatsumoto (1970).