



United States Geological Survey
Certificate of Analysis

Basalt, Hawaiian Volcanic Observatory, BHVO-1

Material for BHVO-1 was collected from the surface layer of the pahoehoe lava that overflowed from Halemaumau in the fall of 1919. Details of the collection, preparation, and testing are available (Flanagan, F.J., 1976).

Element concentrations were determined by cooperating laboratories using a variety of analytical methods. Certificate values are based primarily on international data compilations (Abbey, 1982, Flanagan, 1976, Govindaraju, 1994).

Recommended values

Oxide	Wt %	±	Oxide	Wt %	±
Al ₂ O ₃	13.80	0.21	MgO	7.23	0.22
CaO	11.40	0.17	MnO	0.17	0.01
Fe ₂ O ₃	2.82	0.24	Na ₂ O	2.26	0.07
FeO	8.58	0.09	P ₂ O ₅	0.273	0.025
Fe ₂ O ₃ T	12.23	0.2	SiO ₂	49.94	0.54
K ₂ O	0.52	0.04	TiO ₂	2.71	0.06

Element	µg/g	±	Element	µg/g	±	Element	µg/g	±
Ba	139	14	Ga	21	2	Sm	6.2	0.3
B	2.5	0.6	Hf	4.4	0.2	Sr	403	25
Ce	39	4	La	16	1	Th	1.1	
Co	45	2	Li	4.6	1.5	V	317	12
Cs	0.13	0.06	Nd	25	2	Y	28	2
Dy	5.2	0.3	Pb	2.6	0.2	Yb	2.0	0.2
Eu	2.06	0.08	Rb	11	2	Zn	105	5
F	385	31	Sc	31.8	1.3	Zr	179	21

Information values

Element	µg/g	Element	µg/g	Element	µg/g
As	0.4	Gd	6.4	Se	0.07
B	1.1	Ho	0.99	Ta	1.2
Bi	0.02	Lu	0.29	Tb	0.96
Cl	92	Nb	19	Tm	0.33
Cu	136	Pr	18	W	0.27
Er	2.42	S _{tot}	102		

Bibliography

Abbey, S., 1983, Studies in "Standard Samples" of Silicate Rocks and Minerals 1969-1982, Canadian Geological Survey Paper 83-15, p. 114.

Flanagan, F.J., 1976, Descriptions and Analysis of Eight New USGS Rock Standards, U.S. Geological Survey Professional Paper 840, p. 192.

Govindaraju, K., 1994, 1994 Compilation of Working Values and Descriptions for 383 Geostandards, Geostandards Newsletter, 18:1-158.

Glossary

Fe ₂ O ₃ T	Total iron expressed as Fe ₂ O ₃
Wt %	Percent of total element concentration
µg/g	Total element concentration expressed as micrograms of element per gram of solid sample
±-	One standard deviation

Notes

Unless otherwise indicated total element concentrations are reported for material on an as-received basis, i.e., no drying.

Ordering Information

USGS reference materials (RMs) may be obtained directly from Dr. Stephen A. Wilson at the address or numbers listed below. The price for each bottle of RM is \$65.00 (U.S.) **except** DGPM-1 which is \$150.00 (U.S.). This cost includes all shipping and handling charges using normal mail delivery. Urgent requests for RMs should be initiated by FAX or e-mail. If required, overnight delivery is available with these charges added to the final bill.

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URL: <http://minerals.cr.usgs.gov/geochem/basaltbhvo1.pdf>

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