

Zeitschrift: Schweizerische mineralogische und petrographische Mitteilungen =
Bulletin suisse de minéralogie et pétrographie

Band: 55 (1975)

Heft: 3

Artikel: Preliminary data on mineral standards Basel-Ib (Biotite) and -Ih
(Hornblende)

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DOI: <https://doi.org/10.5169/seals-43078>

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Preliminary Data on Mineral Standards Basel-1b (Biotite) and -1h (Hornblende)

By *Th. Hügi* *), *H. Schwander* **) and *W. Stern* **)

With 2 tables

Since the distribution of the famous rock standards G-1 and W-1, some 25 years ago, quite a number of new silicate rock standards became analyzed by laboratories working on geological samples.

Silicate mineral standards are of special interest because of their natural homogeneity, but came into circulation much later—large quantities of pure mineral (with interesting chemical composition) being quite hard available.

1963, the Mineralogical Institutes of Basle and Berne/Switzerland, started the distribution of a standard biotite and hornblende; 1973 an anorthoclase¹⁾ went under preparation:

standard	mother rock	locality	literature
biotite	monomineralic aggregate	Val Agro	WENK et al.
Basel 1-b	in biotite schist	Ticino	(1963)
hornblende	hornblendite	R. del Motto	WENK et al.
Basel 1-h		Finero	(1974)
anorthoclase	loose crystals from	Mt. Kibo	STERN (1969)
Basel 1-a	Kibo rhombporphyry	Kilimanjaro	

The first two samples were sent – upon request – to nearly 100 laboratories all over the world; by 1974 18 different laboratories had contributed chemical data (see table 1).

For reasons of economy, not all analyses are reported here in detail; tabulated, however, are the evaluation of the main constituents, and the original trace element values. Full data on main constituents may be ordered from the library of the Mineralogical Institute/University of Basle, Switzerland.

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¹⁾ Powdered samples are delivered by the Geochemical Laboratory, Bernoullistrasse 30, CH-4056 Basle, Switzerland.

Table 1. *List of participating organizations.*

Corbett, J. A., Min. Research Lab., North Ryde, NSW Australia.
 Gilkes, R. J., University Western Australia.
 Glasser, Dr. F. P., University of Malaya, Kuala Lumpur, Malaysia.
 Hügi, Prof. Th., Universität Bern, Switzerland.
 Kleeman, A. W., University Adelaide, Australia.
 Meisl, Dr. St., Hess. Landesamt für Bodenforschung, BRD.
 Neiva, Prof. C. J. H., Universidade de Coimbra, Portugal.
 Otto, Dr. J. and Czygan, Dr. W., Universität Freiburg i. Br., BRD.
 Poole, Dr. A. B., Queen Mary College, University of London, UK.
 Randall, B. A. O., University New Castle upon Tyne, UK.
 Randle, Dr. K., Scott. Research Centre, East Kilbridge, Glasgow, UK.
 Richter, Dr. P., Universität Würzburg, BRD.
 Schmidt, Prof., Zentr. Geol. Institut, Berlin, DDR.
 Schwander, Prof. H., Universität Basel, Switzerland.
 Thompson, Dr. G., Woods Hole Oceanogr. Institute, Woods Hole, Mass., USA.
 Troll, Dr. G., Universität München, BRD.
 US Geological Survey, Washington, USA.
 Weibel, Prof. M., ETH, Zürich, Switzerland.

In a first step all chemical data on main constituents were collected, the averages, standard deviations, and coefficients of variation calculated; in a second step only those values falling in between the $\pm 1 \sigma$ range of the first evaluation became considered. Again, averages, standard deviations, and coefficients of variation were calculated, see table 2a. From these data, the «recommended values» are derived. The second decimal digit is only given in case of sufficiently small coefficients of variation. Less reliable data stand in between brackets.

Especially in case of minerals, informations about the trace elements are of interest: one may assume, that the scattering of data is principally due to analytical error, rather than to natural inhomogeneities of the specimen. The “recommended values” for the reported trace elements have to be regarded as rough estimations only, informations yet being too scarce.

Bibliography

- FLANAGAN, F. J. (1974): Reference samples for the earth sciences. *Geochim. Cosmochim. Acta* 38, 1731.
 STERN, W. B. (1969): On the Chemical Composition of Anorthoclase from Mt. Kibo/Kilimanjaro (Tanzania). *Contr. Mineral. Petrogr.* 20, 198.
 WENK, E., SCHWANDER, H., HUNZIKER, J. and STERN, W. (1963): Zur Mineralchemie von Biotit in den Tessiner Alpen. *Schweiz. Mineral. Petrogr. Mitt.* 43, 435.
 WENK, E., SCHWANDER, H. and STERN, W. (1974): On Calcic Amphiboles and Amphibolites from the Lepontine Alps. *Schweiz. Mineral. Petrogr. Mitt.* 54, 97.

Table 2a.

Evaluation: Mineral Standard Basel-1b (biotite)

<i>A. All values considered</i>					<i>B. Values in between 1 σ \pm considered</i>				<i>C. Recommended values</i>
	N	Average wt-%	Stand- ard devi- ation	Coeff. of vari- ation	N	Average wt-%	Stand- ard devi- ation	Coeff. of vari- ation	wt-%
SiO ₂	15	37.36	1.01	5.8	13	37.53	0.41	1.1	37.5
Al ₂ O ₃	15	17.28	0.53	3.1	10	17.23	0.27	1.6	17.25
Fe ₂ O ₃	10	1.74	0.43	24.7	6	1.76	0.18	10.2	1.75
FeO	9	10.63	0.38	3.6	8	10.52	0.25	2.4	10.5
MnO	17	0.09	0.02	22.1	16	0.09	0.01	11.1	0.09
MgO	14	16.32	0.69	4.2	11	16.23	0.45	2.8	16.2
CaO	14	0.09	0.08	89	11	0.07	0.03	43	(0.07)
Na ₂ O	13	0.38	0.09	23.7	9	0.36	0.05	13.9	0.36
K ₂ O	17	9.15	0.20	2.2	12	9.11	0.11	1.2	9.1
TiO ₂	13	2.41	0.25	10.4	11	2.50	0.08	3.2	2.50
P ₂ O ₅	4	0.04	0.04	100					(0.04)
H ₂ O ⁺	5	3.62	0.45	12.4	4	3.75	0.38	10.1	3.75
H ₂ O ⁻	6	0.43	0.24	56	4	0.28	0.12	43	(0.28)
									<hr/> 99.39
Fe ₂ O ₃ _{tot}	13	13.56	0.22	1.6	9	13.47	0.15	1.1	13.45
H ₂ O _{tot}	4	3.47	0.69	19.9	3	3.17	0.40	12.6	3.2

Mineral Standard Basel-1h (hornblende)

SiO ₂	11	43.29	0.77	1.8	7	43.29	0.47	1.1	43.3
Al ₂ O ₃	13	15.62	0.52	3.3	9	15.66	0.30	1.9	15.65
Fe ₂ O ₃	7	1.07	0.28	26.2	5	1.20	0.21	17.5	1.2
FeO	7	5.68	0.48	8.5	5	5.59	0.14	2.5	5.6
MnO	13	0.10	0.01	10.0	8	0.10	0.005	5.0	0.10
MgO	11	16.80	0.89	5.3	9	16.74	0.58	3.5	16.75
CaO	13	11.72	0.18	1.5	10	11.71	0.09	0.8	11.70
Na ₂ O	10	2.52	0.16	6.4	8	2.55	0.10	3.9	2.55
K ₂ O	13	0.28	0.07	25.0	9	0.28	0.04	14.3	0.3
TiO ₂	10	0.32	0.05	15.6	7	0.30	0.01	4.3	0.30
P ₂ O ₅	6	0.02	0.03	150					(0.02)
H ₂ O ⁺	3	2.13	0.31	14.6	2	2.31			2.3
H ₂ O ⁻	4	0.11	0.07	64	3	0.08	0.03	37.5	0.1
									<hr/> 99.87
Fe ₂ O ₃ _{tot}	12	7.39	0.38	5.1	8	7.32	0.21	2.9	7.3
H ₂ O _{tot}	6	2.39	0.30	12.6	5	2.49	0.17	6.8	2.5

*Mineral Standard Basel-1a (anorthoclase)**Tentative values*

SiO ₂	60.6
Al ₂ O ₃	21.8
Fe ₂ O ₃ _{tot}	1.6
MgO	0.2
CaO	2.7
Na ₂ O	6.9
K ₂ O	4.1
TiO ₂	0.4
H ₂ O	0.8
Sum	<hr/> 99.1

Table 2b.

Trace elements of mineral standards Basel-1b and Basel-1h (ppm)

<i>Basel-1b</i> (biotite)		Tentative Value	<i>Basel-1h</i> (Hornblende)	Tentative Value
Elements				
Li	105, 90, 105, 115, 73	100	13, 10, 10	10
Be	<5, 4.9, <10	5	<1, <1	<1
B	<10, <5, <5	<5	<10, 5, <5	5
F	3000	(3000)	100	(100)
Cl	400	(400)	300	(300)
Sc	50, 40.0, 52, 85, 30	50	30, 31.7, 30	30
V	70, 120, 138, 320, 400	200	245, 150, 240, 430	250
Cr	1000, >500, 820, 1200, >1200, 1000, 855, 930	1000	875, 700, 820, 650, 1700, 800, 760, 720	800
Co	100, 90, 58, 69, 65, 53, 110	70	45, 30, 50, 70, 60, 75	60
Ni	1000, >400, 2080, 665, 880, 650	850	240, 200, 255, 300, 380	250
Cu	30, 3, 3, 65, <10	<10	30, 30, 20, 35, <10	30
Zn	180, 300, 135, 235, 240	210	<40, 35, 65	35
Ga	50, 17, 30, 59	40	10, <5, 12	10
Ge	50	(50)	30	(30)
Rb	590, 570, >1000, 360	600	12, 30, <10, <10	10
Sr	10, 30, 10, <10	10	245, 300, 210, 200, 250, 265	250
Y	20, 7	15	15, 10	15
Zr	160, <200, <30, 36, <1	10	65, <30, 11	15
Nb	30, 95	50		
Mo	1.5, 22, <1, <10	<10	4, <10	5
Ag	<1	(<1)	<1	(<1)
Cd	<2	(<2)	<2	(<2)
Sn	15, 15, 162	15	5	(5)
Sb	3	(3)	<0.3	(<0.3)
Cs	23.5, <30	24	<1	(<1)
Ba	1100, 1000, 980, 860, >1200, 965, 1500	1000	30, 30, <100, 25, 65, 50	30
La	50, 38.7	40	26.4	(26)
Ce	88	(88)	14	(14)
Nd	52	(52)	18	(18)
Sm	10.5	(11)	9.0	(9)
Eu	0.27	(0.3)	0.44	(0.4)
Yb	2	(2)		
Lu	<0.1	(<0.1)	0.20	(0.2)
Hf	1.0	(1)	0.61	(0.6)
Ta	4.2	(4)	<0.2	(<0.2)
Tl	<20	(<20)		
Pb	15, <10, 10, <2, 15	10	10, <5, 2, 25	10
Bi	<2	(<2)	<2	(<2)
Th	15.6	(16)	<0.8	(<0.8)
U	<10	(<10)	<10	(<10)

When only one analysis is given, the recommended value is printed between brackets. The data are presented in chronological order (eldest to the left).

Manuscript received August 28, 1975.