Bull. Natn. Sci. Mus., Tokyo, Ser. C, 10 (2), June 22, 1984

# Major Constituents in the Six New Geochemical Standards

By

**Tokiko TIBA***

**Abstract**—The six new geochemical standards, JA-1, JB-2, JB-3, JGb-1, JR-1 and JR-2 issued from Geological Survey of Japan, are analysed for major constituents by conventional methods.

The first two geochemical standard rock samples, JB-1 (basalt) and JG-1 (granodiorite), have been analysed by many analysts. ANDO *et al.* (1971) compiled the analytical data on major, minor constituents and Sr isotopic ratios of these two samples and showed their grand averages as consensus means. Since then these samples have served as reliable reference materials for both instrumental and conventional analyses in many laboratories for over a decade. In 1982, the Geological Survey of Japan prepared six new whole-rock powder samples, JA-1 (andesite), JB-2 (tholeiitic basalt), JB-3 (high-alumina basalt), JGb-1 (gabbro), JR-1 and JR-2 (rhyolite obsidians). Addition of these six new standards to the former ones enhances utility as reference materials covering a wide range of composition for both major and minor constituents. It is necessary for these samples to be analysed by many analysts for the establishment as reference materials.

One set of the six new standards (50 grams each) has been given to our department together with their hand specimens. Chemical analyses of these samples were done on major constituents and the results were tabulated herein (Table 1). The analytical procedures and instruments are the same as those described by TIBA (1970), except for $H_2O$ determination. Short descriptions of the methods are given below.

| | |
|---|---|
| $SiO_2$ and $R_2O_3$ | gravimetry |
| $TiO_2$ | absorptiometric method (hydrogen peroxide method) |
| $Al_2O_3$ | $R_2O_3$—(total iron as $Fe_2O_3$+MnO+$P_2O_5$) |
| total iron | titrimetry (potassium permanganate method) |
| $Fe_2O_3$ | total iron as $Fe_2O_3$—($TiO_2$+1.1113FeO) |
| FeO and CaO | titrimetry (potassium permanganate method) |
| MnO | absorptiometric method (ammonium persulfate method) |
| $Na_2O$ and $K_2O$ | atomic absorption spectrophotometry |
| $H_2O\pm$ | Karl Fischer method (type CA-02 moisturemeter, Mitsubishi Chemical Industries Ltd.) |
| $P_2O_5$ | titrimetry (ammonium phosphomolybdate method) |

The data obtained are consistent with those compiled by ANDO (personal comminucation), but slightly deviated from those of Geological Survey of Japan (ANDO *et al.*,

* Department of Geology, National Science Museum, Tokyo

Table 1. Chemical analyses of the standard samples.

| | JA-1 | JB-2 | JB-3 | JGb-1 | JR-1 | JR-2 |
|---|---|---|---|---|---|---|
| $SiO_2$ | 63.72 | 52.95 | 50.51 | 42.86 | 74.83 | 75.40 |
| $TiO_2$ | 0.86 | 1.34 | 1.51 | 1.74 | 0.14 | 0.05 |
| $Al_2O_3$ | 15.89 | 14.65 | 17.62 | 17.95 | 13.05 | 13.12 |
| $Fe_2O_3$ | 2.20 | 3.51 | 3.82 | 4.73 | 0.31 | 0.35 |
| FeO | 4.30 | 9.75 | 7.45 | 9.72 | 0.69 | 0.64 |
| MnO | 0.16 | 0.23 | 0.18 | 0.20 | 0.10 | 0.11 |
| MgO | 1.54 | 4.59 | 5.20 | 7.95 | 0.11 | 0.05 |
| CaO | 5.60 | 9.66 | 9.54 | 11.86 | 0.75 | 0.51 |
| $Na_2O$ | 3.94 | 2.18 | 2.87 | 1.31 | 4.07 | 4.15 |
| $K_2O$ | 0.91 | 0.45 | 0.82 | 0.33 | 4.36 | 4.44 |
| $H_2O^+$ | 0.60 | 0.20 | 0.16 | 1.11 | 1.04 | 1.15 |
| $H_2O^-$ | 0.39 | 0.12 | 0.06 | 0.18 | 0.10 | 0.19 |
| $P_2O_5$ | 0.13 | 0.09 | 0.17 | 0.04 | 0.02 | 0.01 |
| total | 100.24 | 99.72 | 99.91 | 99.98 | 99.57 | 100.17 |

JA-1 andesite. Hakone Volcano (somma), Manazuru, Ashigarashimo-gun, Kanagawa Prefecture. split 10, position 27.

JB-2 tholeiitic basalt. O-shima Volcano, northern rim of the central pit of the Mihara crater. split 10, position 30.

JB-3 high alumina basalt. Fuji Volcano (Aokigahara lava flow), Narusawa, Minamitsuru-gun, Yamanashi Prefecture. split 10, position 127.

JGb-1 gabbro. Utsushigatake, mount Utsushigatake, Abukuma, Fukushima Prefecture. split 6, position 90.

JR-1 rhyolite. Wada-Toge obsidian, northern part of Wada-Toge, Chiisagata-gun, Nagano Prefecture. split 2, position 28.

JR-2 rhyolite. Wada-Toge obsidian, southern part of Wada-Toge, Suwa, Nagano Prefecture. split 4, position 82.

1983), especially on $SiO_2$ and $Al_2O_3$ contents. $SiO_2$ contents generally lower in the present work than those of Ando *et al.* (1983), even though recovery of $SiO_2$ was made, and vice versa in $Al_2O_3$ contents. Indirect determination of $Al_2O_3$ mentioned above is affected by errors of determination on total iron, MnO and $P_2O_5$ contents and results in high $Al_2O_3$ contents in the present study.

Acknowledgments. The author is indebted to Dr. Atsushi ANDO who provided these geochemical standards.

## References

ANDO, A., H. KURASAWA, T. OHMORI & E. TAKEDA, 1971. 1971 compilation of data on rock standards JG-1 and JB-1 issued from the Geological Survey of Japan. *Geochemical Jour.*, **5**: 151–164.

———, T. OHMORI & S. TERASHIMA, 1983. Ten geochemical standards issued from the Geological Survey of Japan and their chemical compositions. Abstract of Annual Meeting of Geochemical Society of Japan, 1983 at Hachioji: 168–169. (In Japanese.)

TIBA, T., 1970. JB-1 and JG-1 — Geological Survey of Japan silicate rock standards—. *Jour. Geol. Soc. Japan*, **76**: 441–447.