

Chromium Content of Volcanic Rocks

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The chromium contents of volcanic rocks of both Japan and Manchuria were determined, and it was clarified that many of the Japanese basalts contain considerably smaller amounts of chromium compared with those of the Manchurian basalts.

The chromium contents of several rock-forming minerals as well as the distribution of the element among them were also studied.

Method for the Determination of Chromium.—For the determination of chromium, Sandell's colorimetric method⁽¹⁾ was adopted. Preliminary experiments were carried out in detail to examine the accuracy of the method.

Results Obtained.—In order to study the geochemistry of chromium in Japanese volcanic rocks, the chromium contents of 27 basaltic rocks, 30 andesites, 13 dacites and 11 liparites (including 3 obsidians) were determined. Fourteen basalts from Manchuria, one specimen of German basalt occurred near Göttingen, 3 granites from Japan and 3 composite samples of shales²⁾ were also analyzed and the results were compared with those of Japanese volcanic rocks.

Number of specimens containing less than 0.0005, 0.0005 to 0.001, 0.001 to 0.005, 0.005 to 0.01 and more than 0.01 % Cr_2O_3 in each rock-types are shown in Table 1.

Eleven rock-forming minerals which were carefully separated from rocks were studied. The results are given in Table 2, together with the data obtained by E. Traeger.³⁾

Geochemical Discussions. A. The Relation between Chromium and Silica Contents of Rocks.—As indicated in Table 1, the

Table 1
Number of specimen contg.

Group of samples	less than 0.0005%	0.0005~0.001 %	0.001~0.005 %	0.005~0.01 %	more than 0.01%
Japanese basaltic rocks }	2	2	4	11	8
Japanese andesites }	7	3	13	5	2
Japanese dacites }	3	3	7	0	0
Japanese liparites }	11	0	0	0	0
Manchurian basalts }	0	1	0	0	13
German basalts }	0	0	0	0	1
Japanese granites }	2	1	0	0	0
Composite sample of shales }	0	0	0	1	2

chromium content in volcanic rocks varies in very wide range. The chromium contents for the series of plutonic rocks given by V. M. Goldschmidt⁽⁴⁾ are as follows:

Peridotite	0.50 % Cr_2O_3
Gabbro	0.05
Diorite	0.01
Granite	0.0003
Nepheline syenite	0.0001

In the present study the analogous relations are again recognized. Although it is recognizable that some basalts contain very little chromium, the element is generally concentrated in basic rocks, and we find the tendency that the chromium content decreases as the acidity of rocks increases, and in the group of liparites all specimens contain only traces of chromium.

In some basalts which showed higher chromium content, such as olivine basalt, Shodohima, picotites and other proper minerals of

(1) E. B. Sandell, *Ind. Eng. Chem., Anal. Ed.* **8**, 336 (1936).

(2) These composite samples were prepared by Dr. Noll and Prof. E. Minami. cf. *Nachrichten von Gesellschaft wiss. Göttingen, math-phys. Klass. Fachgr. IV.* **14**, 155 (1935).

(3) E. Traeger, *Chemie der Erde*, **9**, 3286 (1935).

(4) V. M. Goldschmidt, *J. Chem. Soc.* **1937**, 662.

Table 2

Location	Sepd. form	Oliv.	Pyroxene				Hor.	Mag.	Plag.
			Au.	En.	Cr-dio.	pig.			
Nishigatake (Saga Pref.)	basalt	0.048	0.44						
Hitotumegata		0.008							
East Manch.	olivine nodules	0.019		0.41	0.81				
Hakone	hyperth. andesite								none
Haruna	andesite						0.0009		
Formosa	andesite						0.0027		
Hakone	allivalite	0.009							none
Oshima (Izu)	An-ei lava					0.005		0.017	
Asama			0.04						
Oshima (Izu)	dolerite							0.0027	
Azuro (Izu)	olivine-eucrite	0.001							
Values given by Traeger		0.02~ 0.2	0.02~ 0.2	1~3			0.02~ 0.2		

Figures are given in % Cr_2O_3 .

chromium were detected by petrographers. The wide variation in chromium content seems to be closely connected with both the formation and the separation of these proper minerals in the course of magmatic fractional crystallization.

B. Comparison of Japanese Basalts with those of Manchurian.—With one exception of leucocratic basalt (0.0005 % Cr_2O_3), all of the Manchurian basalts contain more than 0.01 % Cr_2O_3 . Therefore the mean value of them is about three times that of Japanese basalts.

German basalt that occurred near Göttingen shows nearly the same value as the mean value of Manchurian basalts.

G. v. Hevesy, A. Merkel and K. Wuerstlin⁽⁵⁾ gave 0.053 % Cr for the composite sample of igneous rocks, and their data are several times the mean value of Manchurian basalts.

C. Distribution of Chromium among Rock-forming Minerals.—As Table 2 shows,

(5) G. v. Hevesy, A. Merkel and K. Wuerstlin, *Z. anorg. allgem. Chem.* **219**, 192 (1934).

mafic minerals are much more enriched with chromium than plagioclases. Among the mafic minerals, it seems that the chromium is concentrated in the order of pyroxene, olivine and hornblende.

D. It is remarkable that the composite samples of shales contain 0.0095 to 0.013 % Cr_2O_3 . This value is almost the same as those of Japanese basaltic rocks.

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