The Mineral Glauconite from Fujikoto-Mura Akita Prefecture

by

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Preface

In recent years, with the development of the study on the so-called green minerals, a number of literatures have been accumulated and our knowledge concerning the green minerals has advanced to a considerable extent.

In this paper, the writer mentions the modes of occurrence, chemical composition, and some other physical characters of the glauconite from Fujikoto-mura, as one of the data for the study of green minerals.

The area covered by the writer's survey in 1942 and 1952 is about 5 km. northeast of Fujikoto, Fujikoto-mura, Yamamoto-gun, Akita Prefecture.

Thanks are due to Asst. Prof. S. KONDO of Chiba University, who gave the writer great assistance in the course of this study, and to Mr. M. NAMIKI of the Scientific Research Institute, Ltd., who kindly carried out the chemical analysis of glauconite specimens.

Modes of Occurrence of Glauconite

The geology of this area was already reported by Y. CHITANI (1924 and 1930) and that of Tsuzureko-mura east of this area by R. IMAIZUMI and T. KOTAKA (1952).

The central part of this area is composed of dark gray andesite and the lower Nanakura tuff (Y. CHITANI, 1930) rests upon the andesite. Glauconite is principally contained in the so-called glauconitic sandstone which is interbedded in the lower Nanakura tuff. This tuff is generally pumiceous and, as stated above, contains the glauconitic sandstone.

The glauconitic sandstone is deep green and coarse-grained. It weighs light and the apparent specific gravity is about 2. The greater part of the glauconitic sandstone is composed of glauconite grains which are deep green or black to the naked eye. At Takinosawa the glauconitic sandstone contains a number of pyrite-crystals and in some places also contains fossils of marine shells, sponge spicules, echinoid spines, etc., some of which are substituted by green glauconitic materials. This is one example showing the association of glauconite with marine fossil shells as have been reported by many writers.

The glauconitic sandstone has the appearance of having suffered actions of hot spring water. Practically, two hot springs are at Yunosawa and Sekinezawa and around the two occurs the glauconitic sandstone or andesite and tuff which are altered to green materials in part. This fact may possibly suggest a genetic relationship between glauconite and probably submarine hot spring.

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Microscopic Observation

The glauconitic sandstone consists of glauconite grains (Fig. 1), plagioclase (Fig. 2), quartz, volcanic rock fragments (Fig. 3), and a small amount of interstitial green materials. The glauconite grains constitute the greater part of the sandstone.

Fig. 1. Glauconite grains removed from the glauconitic sandstone.
($\times 40$)

Fig. 2. Glauconitic sandstone.
Pl: Plagioclase
Gl: Glauconite grain
(Crossed nicols, $\times 40$)

Fig. 3. Glauconitic sandstone.
B. R. F.: Basaltic rock fragment
Gl: Glauconite
P: Plagioclase
(Open nicols, $\times 40$)

Fig. 4. Reticulate structure in a grain of glauconite, indicated by arrow.
(Crossed nicols, $\times 100$)

Fig. 5. Crossed figures in a grain of glauconite, indicated by arrows.
(Crossed nicols, $\times 100$)

Mafic minerals such as biotite, pyroxene, and amphibole are absent.

The size of the glauconite grains ranges commonly from 0.5 to 2 mm. and rarely attains more than 2 mm. They are all green in thin sections and the form is irregularly rounded or elliptical, but some of them are angular. This roundness may be the primary feature of the glauconite, that is—these glauconite grains had already been rounded when they deposited. They appear homogeneous and cryptocrystalline, but under the crossed nicols they show fine fibriform or reticulate structure (Figs. 2 and 4), some having crossed figures (Fig. 5).

The refractive indices of the glauconite from this area are as follows:

$$\alpha = 1.618 - 1.620 \quad \gamma = 1.649 - 1.652$$

$$\gamma - \alpha = 0.031 - 0.032$$

These values, so far as the writer knows, are relatively higher than those of other glauconites reported, probably indicating a characteristic of this glauconite. The pleochroism is not distinct. The specific gravity is between 2.6 and 2.7.

Chemical Composition

The chemical compositions of the glauconitic sandstone from Takinosawa and of the glauconite grains removed from the former are shown in the following table (Nos. 1~4, M. NAMIKI, analyst 1954). Nos. 5~8 are cited from other literatures for comparison.

No.	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MgO	CaO	K ₂ O	Na ₂ O	H ₂ O	Total
1	53.54	7.55	11.49	4.05	6.24	1.19	4.49	1.27	10.05	99.87
2	52.89	8.13	10.68	3.64	8.14	1.58	5.67	0.22	9.83	100.78
3	56.85	5.01	13.33	4.41	3.58	1.72	3.13	1.98	10.22	100.23
4	57.68	4.08	15.09	4.28	5.67	1.47	4.13	0.60	8.48	101.48
5	54.0	3.6	11.4	2.9	5.2	2.7	4.1	0.6	16.0	100.5
6	54.30	5.08	14.77	4.82	6.05	0.80	4.85	3.82	5.64	100.22
7	51.11	4.88	22.67	3.20	3.52	0.52	6.88	0.63	6.34	99.75
8	51.55	4.03	22.17	3.54	3.86	0.69	7.03	0.55	6.62	100.07

Nos. 1~2: Glaucosite grains

No. 3: Green earthy cementing material of the glauconitic sandstone

No. 4: Glaucositic sandstone

No. 5: Celadonitic green glass fragments (SUDO, T., 1951)

No. 6: Celadonite (MnO: 0.09%) (HENDRICKS, S. B. and ROSS, C. S., 1941)

No. 7: Glaucosite (HENDRICKS, S. B. and ROSS, C. S., 1941)

No. 8: Glaucosite (P₂O₅: 0.03%) (YAGI, T., 1930)

Before going into considerations on the above, the differences of chemical composition between glauconite and celadonite should be mentioned here.

According to S. B. HENDRICKS and C. S. ROSS (1941), the differences of chemical

composition between the two minerals are, generally, (1) celadonite has more SiO_2 than glauconite; (2) Fe_2O_3 is more in glauconite than in celadonite; (3) the value of $\text{Fe}_2\text{O}_3/\text{FeO}$ for glauconite is larger than that of celadonite; and (4) MgO is more in celadonite than in glauconite. Although the two minerals vary much in chemical composition, the above-stated four differences seem to be generally recognised.

T. SUDO (1951) also refers to this subject and states that celadonite has more SiO_2 than glauconite; the value of $\text{Fe}_2\text{O}_3/\text{FeO}$ for glauconite is larger than of celadonite; and K_2O and H_2O of the two minerals are approximately the same.

From the above statements the glauconite grains (Nos. 1~2) are rather celadonitic in chemical composition than to be glauconitic. This may be a noteworthy fact because the occurrence and the physical characters of the glauconite grains are those of normal glauconite.

Japanese glauconites are almost from sedimentary rocks, but a glauconite forming irregular veins in basalt was reported from Geijitsu-gun, N. Keisho-do, Korea, by Y. KINOSAKI (1934) and I. TATEIWA (1935). This glauconite is genetically related to basalt and has much SiO_2 (61.06%) and less Fe_2O_3 (3.47%). Therefore, it may be said that this glauconite is celadonitic not only in chemical composition but in occurrence.

However, as already pointed out by S. B. HENDRICKS and C. S. ROSS (1941), there occur no essential differences between the two minerals though some apparent differences are of course present, and the two may be distinguished from each other only by occurrence and genetical environment. According to A. N. WINCHELL (1951), celadonite is a variety of glauconite.

Conclusions

1. The glauconite in this area constitutes the greater part of the glauconitic sandstone interbedded in the lower Nanakura tuff. It occurs as rounded or elliptical grains commonly from 0.5 to 2 mm. in size, and shows the association with marine fossil shells. That is, from the modes of occurrence and the physical characters such as form, color, refractive indices, and specific gravity, this glauconite is a normal glauconite.

2. The chemical composition of this glauconite, however, is celadonitic. This fact may indicate that no essential differences are between glauconite and celadonite though some differences of chemical composition are generally recognised. Accordingly, if needed to distinguish the two minerals from each other, mode of occurrence and genetical environment are preferable to physical and chemical characters.

3. Very little is known regarding the genesis of this glauconite. The lower Nanakura tuff is generally pumiceous and the apparent specific gravity of the glauconitic sandstone is small. From these facts and its mode of occurrence, the glauconitic sandstone is no doubt a part of the lower Nanakura tuff. It may be said that the glauconite grains are not the alteration product from mafic minerals because the glauconitic sandstone contains no mafic minerals and the roundness of the grains seems to be the primary feature. The glauconitic sandstone appears to have suffered actions of hot spring water and, practically, the rocks around the two hot springs are altered to green materials. From this point of view, some genetical relationship between this glauconite and the submarine hot spring accompanied by the submarine eruption of andesite may be taken into consideration. The writer would like to think that, apart from the question of its chemical changes, this

glaucosite is a primary mineral formed in relation to the actions of submarine hot spring.

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秋 田 県 藤 琴 村 の 海 緑 石

門 田 長 夫

(摘 要)

秋田県山本郡藤琴村藤琴の北東約 5 km の藤琴川東岸地域より海緑石の産出が知られている。海緑石は主として当地域の第三系最下部、安山岩の上にある下部七座凝灰岩中に含まれるいわゆる海緑石砂岩の大部分を構成している。その賦存状況・物理的性質・海の貝化石を伴う事などよりこの海緑石は通常海緑石である。しかしその化学成分は、むしろセラドナイトの化学成分を持つている。すなわち、当地域の海緑石は化学成分においてはセラドナイト、その他の点では海緑石の性質を有している。この事は海緑石とセラドナイトとの間には、本質的な差異は存在しないという可能性を示すのではなかろうか。したがって、必要にしてこの2つの鉱物を区別するには、物理化学的性質よりもむしろ賦存状況および生成環境の方が適当と考えられる。当地域の海緑石の成因については多く知られない。しかしいわゆる海緑石砂岩の賦存状況・顕微鏡観察、および現在の温泉附近の状況などより、この海緑石は少なくとも mafic mineral よりの変質物ではなくして、海底の安山岩噴出に伴う温泉作用との関連において生じた一次的の鉱物であろうと推定した。