COEXISTING RELATION OF SOME PIGEONITE AND AUGITE IN GABBRO FROM HIMESHIMA ISLAND, GOTO ISLANDS

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1. INTRODUCTION

Up to recent, in Japan, a few authors have reported pigeonite in ejected plutonic fragments (Kuno, 1940; Isshiki, 1958)*.

The present author found pigeonite and augite, which have a strange relationship to each other, in gabbroic rocks from Himeshima Island. In this paper, he gives a mode of occurrence of the pigeonite and the augite, with brief description of other minerals in the same rock.

The author is greatly obliged to Professor S. Taneda of Kyushu University for his guidance and critical reading of this manuscript. He wishes to express his thanks to Assistant Professor M. Yamaguchi and other stuffs of Geological Institute of Kyushu University for their kind advices and criticisms. Finally, the author would like to acknowledge partial financial support by a Grant in Aid for Fundamental Scientific Research from the Ministry of Education of Japan.

2. FIELD OCCURRENCE AND ROCK DESCRIPTION

Himeshima Island is located at about 7 km north of Fukue Island of Goto Islands. Plutonic rock from Himeshima Island is divided into three facies, i.e. HM-1 (Two pyroxene gabbro), HM-2 (Pigeonite bearing two pyroxene gabbro) and HM-5 (Clinopyroxene gabbro).

The relations between pigeonite and augite in HM-5 are described in detail. Most part of HM-5 shows hypidiomorphic granular texture, and other part of HM-5 shows ophitic texture. HM-5 contains plagioclase, augite, alteration product and small amount of pigeonite and magnetite. Modal composition of HM-5 is shown in Table 1. Plagioclase crystals are subhedral or euhedral, and twinned specially after the albite law. Most of them show

* Harumoto (1933) has reported porphyritic pigeonite in syenite-porphry from Utsuryoto Island. The syenite-porphry exists as volcanic ejecta.

Table 1. Constituent minerals, optic properties and modal compositions of HM-5.

Mineral	Properties and/or composition	Modal composition %
Plagioclase	$\gamma_{\text{max.}} = 1.587$ $\alpha_{\text{min.}} = 1.551$ An. 95-45 mol. %	85.1
Augite	$\beta = 1.693$ $2V_Z = 46^\circ$ Wo ₃₈ En ₄₁ Fs ₂₁ mol. %	7.4
Pigeonite	$\beta = 1.722$ $2V_Z = 0^\circ$ Wo ₉ En ₃₁ Fs ₆₀ mol. %	0.6
Magnetite	$a = 8.398 \text{ \AA}$	1.7
Altered product		5.1

slightly normal zoning. Their compositions, as a whole, range from An. 95 (mol.) to An. 45 (mol.). Some plagioclases consist of sodic mantle (An. 50 mol.*) and calcic core (An. 95 mol.*) which is somewhat irregular in shape. All of pigeonites and most of augites are anhedral and subhedral respectively, and hardly showing zonal structure. Some of augites are closely related to

Fig. 1. Feature of the pigeonite and the augite of HM-5 under microscope.

* This composition is determined using the diagram which Tomisaka proposed (Fig. 29 of Tomisaka, 1962).

Fig. 2. A relative orientation of optic elasticity axes of the pigeonite and the augite. The number corresponds with that of Fig. 1. Solid circle: Optic axis of the augite. Open circle: Optic axis of the pigeonite. These 2E are not corrected by β -index of each crystal grain.

pigeonites. They have approximately the same composition with the augite which is not related to pigeonite, according to their X-ray diffraction patterns. Magnetites are always anhedral, and in extreme case they show rugged external form. The unit cell dimension of magnetite is 8.398 Å. There are magnetites which are closely related to the pair of pigeonite and augite. Most of them are included in the augite, and are partially in contact with pigeonite and/or plagioclase. Alteration product seems to be derived from augite and/or pigeonite.

3. MODE OF OCCURRENCE OF PIGEONITE AND ASSOCIATED AUGITE

Feature of pigeonite and associated augite under microscope is shown in Fig. 1. At nite of No. 511 seems to be surrounded with augite. The boundary between the two minerals can be clearly observed at a certain rotated position of stage of microscope in crossed nicols. Cleavages continue across a irregular boundary line of the paired two minerals.

Relative orientations of optic elasticity axis of ten pairs of pigeonite and augite were determined by universal stage.

Some relations of the pigeonite and augite are shown in Fig. 2. It is noticeable that the angle between X-axes (or Y-axes) of pigeonite and augite is always larger than that between Z-axes of the two minerals. The angles between Z-axes of them varies from 0° to 8°*, with a mean value of 3.4°. In other words, the both minerals seem to rotate (8°, 26°, 36°, 76°, 80°, 85°) against each other around Z-axes which are approximately coincident. The author considers that the coincidence of the Z-axes of two minerals is not accidental, but is caused by genetic restriction.

4. SUMMARY

In gabbro from Himeshima Island, pigeonite with a strange relation to augite was found. They contact each other with a sinuous line. The relative orientations of optic elasticity axes of the two minerals were determined. So far as the result of the determination is concerned, Z-axes of the pigeonite and the augite approximately coincide with each other, and X-axes or Y-axes of the two minerals are rotated various angles (8°~85°) around such a common Z-axis.

REFERENCES

Harumoto, A. (1933), On kaersutite and pigeonite in volcanic ejecta from

* This value may be included in a error of measurement, because a maximum value of the error is obscure.

- Utsuryoto Island, Chikyu, **19**, 14~28 (in Japanese).
- Isshiki, N. (1958), Petrology of plutonic cognate ejecta from Nishi-yama volcano, Hachijo-jima, the Seven Izu Islands, Japan, Jap. Jour. Geol. Geogr., **29**, 55~74.
- Kuno, H. (1940), On pigeonite-quartz-diorite ejecta from Hakone volcano, Jour. Geol. Soc. Japan, **47**, 175~179 (in Japanese).
- Tomisaka, T. (1962), The results of recent researches on feldspar and its further problems henceforth, Jour. Min. Soc. Japan, **5**, 385~430 (in Japanese).

五島列島姫島産ハンレイ岩におけるピジオン輝石と 普通輝石の共生関係

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摘 要

五島列島姫島に産するハンレイ岩の中に少量ながらピジオン輝石が見い出された。このピジオン輝石のほとんどは普通輝石と接触している。両者は弾性軸 Z をほぼ共有しており, X, Y は相対的に回転しているものが多い。