111. *Find of Aragonite from Kamuikotan Metamorphic Rocks*

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Introduction

The Kamuikotan metamorphic belt has been known as a high pressure metamorphic belt on the basis of common occurrence of glaucophane (Suzuki, 1932), lawsonite (Suzuki, 1938) and jadeite + quartz (Seki and Shido, 1959; Shido and Seki, 1959). It is paired with the Hidaka belt (Miyashiro, 1959 and others) and is located at a probable plates boundary between the Eurasia and Okhotsk (or American) plates (Den and Hotta, 1973). In the course of petrographical works on the metamorphic rocks in the Kamuikotan area, west of Asahikawa, Hokkaido, where the jadeite + quartz assemblage has been described, we have found a few rocks that contain aragonite, probably of metamorphic origin. The following is a preliminary report on the aragonite-bearing rocks.

Identification and Petrography

Aragonite has been sought in 20 carbonate-bearing rocks and 8 among them were confirmed to contain aragonite. Uncovered thin sections were immersed in Feigl's solution and staining of carbonate was examined under the microscope. For typical samples, carbonates were scratched off thin section and X-ray powder patterns were prepared. The examples of aragonite-bearing rocks are described below. Their localities are shown in Fig. 1.

Specimen NG73082102. Calcareous schist from a south-western foot of Mt. Tokiwa, north of the Kamuikotan gorge (loc. A in Fig. 1). The rock consists of the alternation of carbonate-rich and glaucophane-rich foliae (each 0.02 mm ± wide). The constituent minerals are carbonates, parallel symmetric glaucophane, stilpnomelane, quartz, albite, and small amounts of chlorite and a high-refracting mineral, probably sphene. The carbonate-rich foliae mainly consist of aragonite and calcite. Some portions of carbonate-rich foliae consist exclusively of aragonite, but the others of aragonite and calcite.

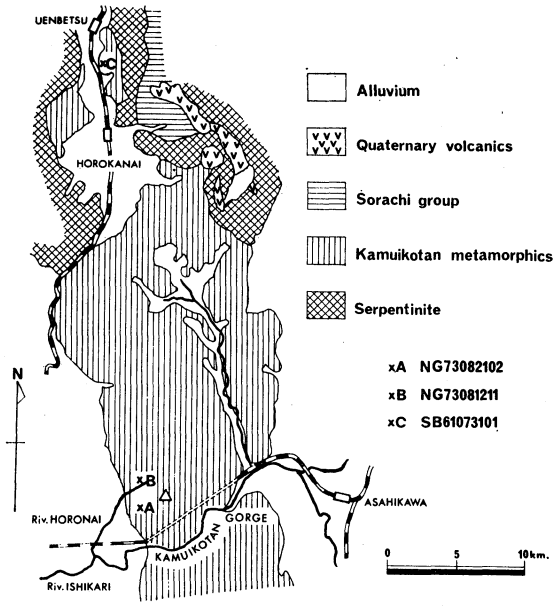

Fig. 1. Geological sketch map of the Kamuikotan-Horokanai area, Hokkaido with the localities of aragonite-bearing rocks described in the text. Map is after Geol. Surv. Hokkaido (1955).

In the latter case, calcite tends to occur at the middle of the foliae. I and II in Fig. 2 are photomicrographs of carbonate-rich foliae before and after the staining by Feigl's solution. Fig. 3 shows the X-ray diffraction pattern of powdered sample scratched out of carbonate-rich foliae.

Specimen NG73081211. Metadiabase collected from an area along the River Horanai, north of the Kamuikotan gorge (loc. B in Fig. 1). The rock preserves the texture of coarse-grained basalt with the interlocking of augite and plagioclase laths, the latter replaced by white micaceous minerals. Pumpellyite and chlorite fill the interstices and cavities. Network veins, consisting of albite alone, of quartz and albite, and of carbonate-quartz-albite are common. Chlorite often occurs at the periphery of the veins and sometimes pumpellyite is

Fig. 2. Photomicrographs of aragonite-bearing rocks.
Abbreviations: A: Aragonite, C: Calcite, Ab: Albite
I (Upper left): Carbonate-rich foliae of a glaucophane schist, NG73082102. (With polarizer only.) Dark portion contains abundant fine-grained sphene.
II (Upper right): Same as I, after stained by Feigl's solution.
III (Lower left): Carbonate-albite vein in metadiabase NG73081211. (With polarizer only.)
IV (Lower right): Same as III. (Between crossed polars.) The dark central portion of large calcite grain is aragonite at extinction position.

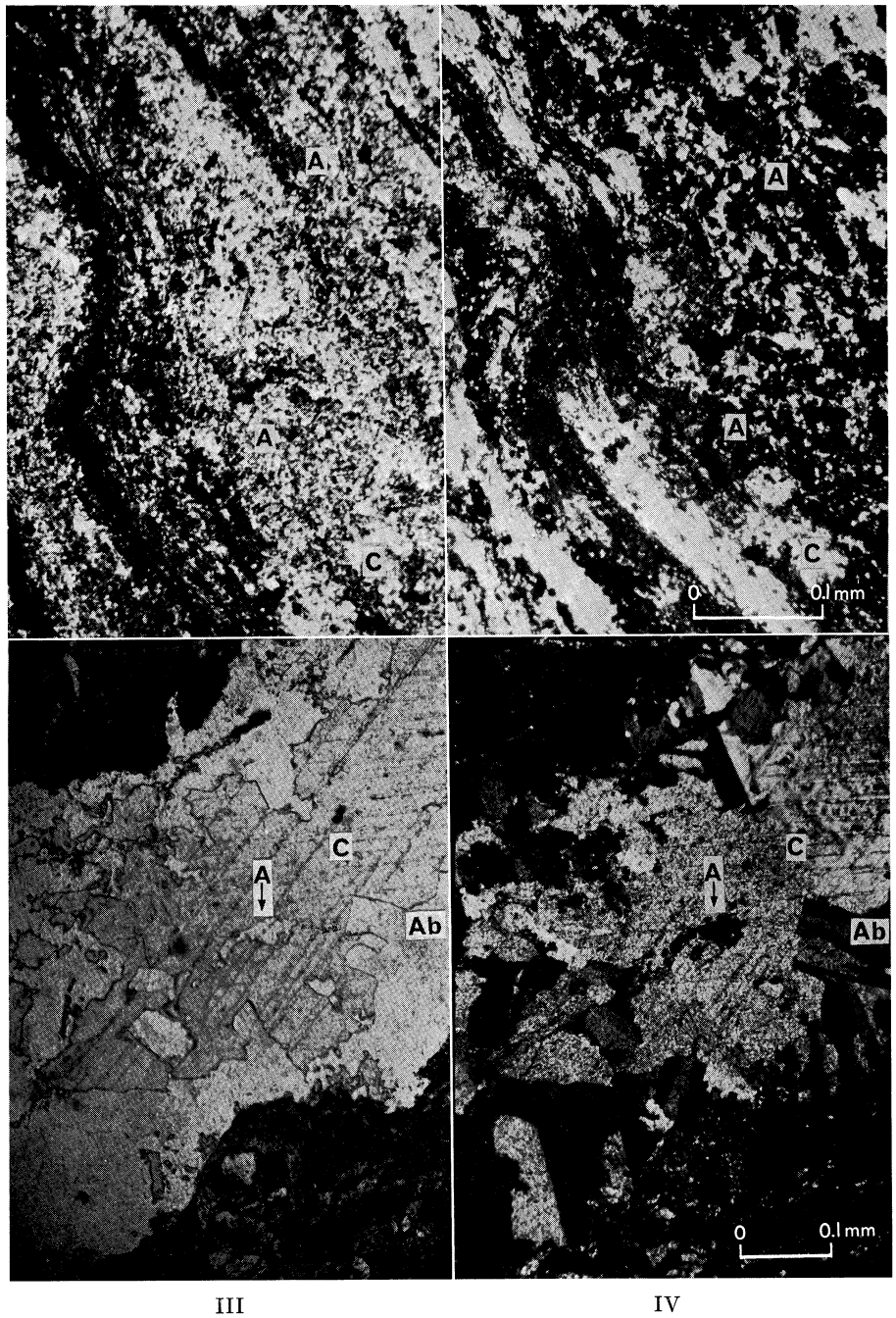

Fig. 2

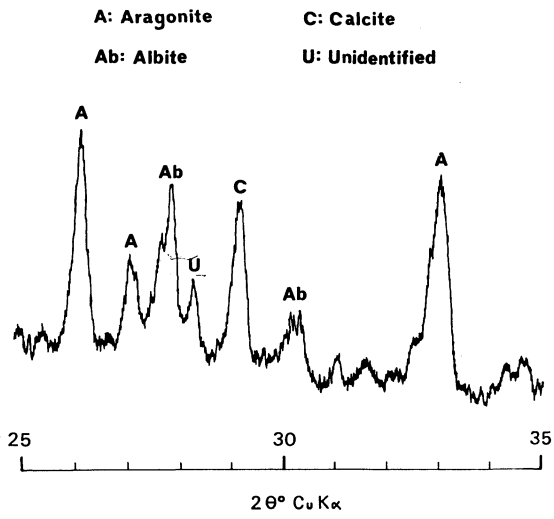

Fig. 3. X-ray powder diffraction pattern of carbonate-rich foliae of aragonite-bearing glaucophane schist, NG73082102.

present in the veins. The middle of the quartz-carbonate-albite vein is occupied by carbonates, which are exclusively calcite in some portions but are aggregates of aragonite and calcite in others. In the latter cases, aragonite forms the core of the aggregate and appears to have been partly replaced by calcite. III and IV in Fig. 2 show the texture of the replacement of aragonite by calcite. Three more specimens with similar modes of occurrence of aragonite have been found from the outcrops nearby that of the present specimen.

Specimen SB61073101. Basic schist consisting of lawsonite, epidote, chlorite and quartz. The specimen was collected from Uenbetsu of the Horokanai area (Banno and Hatano, 1963). The locality is marked by C in Fig. 1.

Aragonite in this specimen occurs in quartz vein which contains jadeite, aragonite and calcite, and it was identified by the staining in Feigl's solution. Two more specimens from Hatano and Banno's collection contain aragonite.

Discussion

Aragonite in the Kamuikotan metamorphic rocks appears to be of metamorphic origin, on the basis that it occurs in carbonate-rich foliae of calcareous schist as well as in network vein containing metamorphic minerals such as jadeite and pumpellyite. Probably, aragonite was formed during and after the formation of schistosity.

Although limestone occurs in the Kamuikotan gorge, we are as yet unable to find aragonite from limestone. Limestone does contain biaxial calcite, but no aragonite has been detected.

Aragonite has been described from a few glaucophanitic metamorphic terrains such as Franciscan (Coleman and Lee, 1962) and New Caledonia (Brothers, 1970). Another reported occurrence of metamorphic aragonite is from prehnite-pumpellyite facies rocks from northwest Washington (Vance, 1968), on which metastable crystallization from strained calcite has been a preferred interpretation (Vance, 1968, Newton *et al.*, 1969). We have no direct evidence against the application of above interpretation to the Kamuikotan occurrence, but the Kamuikotan occurrence is in harmony with the high pressure silicates assemblages and hence we may tentatively take it as an indication of high pressure and low temperature condition of the Kamuikotan metamorphism.

Further study on the regional distribution of aragonite is in progress by one of us (NG).

Acknowledgements

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