7. *On the Modes of Occurrence of Cordierite from Sakkabira, Town Taru-mizu, Kimo-tsuki Province, Kagoshima Prefecture, Japan.*

By Ryōhei MORIMOTO,

Earthquake Research Institute.

(Read Apr. 21, 1946.—Received June 20, 1948.)

The cordierite-bearing lava is petrographically biotite-bearing hypersthene-plagioliparite[1], containing plagioclase (An 35–48%), quartz, hypersthene[2], magnetite, and biotite as phenocysts scattered in the groundmass, the texture of which varies in parts, being microfelsitic in the brittle porous liparitic rock facies, cryptocrystalline in the hard and compact obsidian. Locality of the lava and the geology of the surrounding area are briefly shown in an annexed geologic route map[3].

Distribution of cordierite in the rock is quite heterogeneous: Crystals of cordierite concentrate remarkably to the drusy cavities in the brittle porous parts of the country rock[4] and almost have never been recognized in hard and compact parts. There are usually no crystals of cordierite even where the cavities preponderate, if the flow-structure of the rock is remarkable or if the country rock around the cavities is hard and compact. In the brittle porous rock facies, the comparatively higher crystalline groundmass is composed mainly of tridymite, irregular grains of alkaline feldspar, and a little quantity of quartz, accessorily of a few flakes of fox-brown biotite and iron ore dust. In those parts of the groundmass where the considerable tridymite are concentrated, irregular

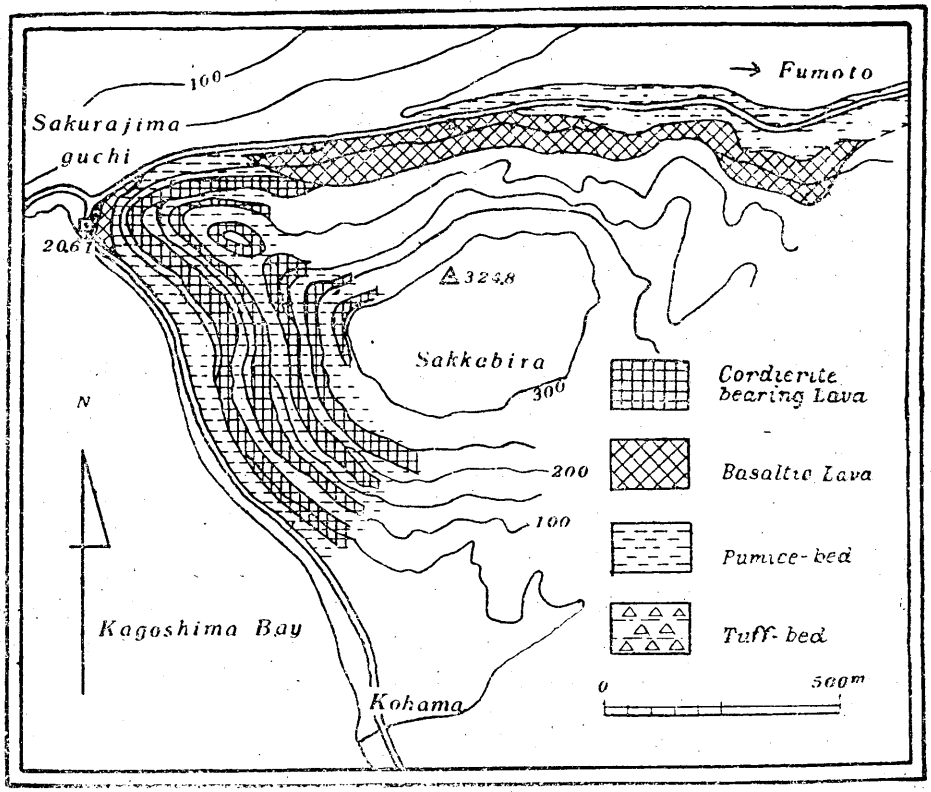
1) K. YAMAGUCHI, "Petrological study of Ash stone around the Bay of Kagosima (Part 4)" *Jour. Geol. Soc. Japan* **45** (1938), 33, (in Japanese).

2) (−) $2V = 62°$ $\rho > v$ about X, ($En_{60}Fs_{40}$ after KUNO's Figure, *Proc. Imp. Acad. Tokyo* **17** (1941), 205. (−) $2V = 58$–$59°$, $n_1 = 1.717$, $n_2 = 1.727$ (YAMAGUCHI *loc. cit.* 335). It is *note-worthy* that in the present hypersthene, there are some ones which have more ferruginous composition, near to En_{50} Es_{50}

3) Prepared in March 1944, with Hideo MINATO of the Mineralogical Institute. Some geological data were supplemented by H. MINATO and Masatsune TANI in Dec. 1944.

4) Nov. 11, 1942, a specimen of porous liparitic rock in the druse of which are contained short prismatic crystals of cordierite with dark bluish lustre, attaining to 1–2mm in length, associated with tridymite, was given by Mr. Junosuke MASUTOMI who found it at first, quite accidentally from the block laid at the roadside near Sakurajima-guchi on his Journey to Osum i.

formed crystals of fayalite[5] or cordierite are ofen found. Euhedral prismatic or tabular crystals of cordierite associated with scaly crystals of tridymite and a little quartz, which are seriate to those minerals in the groundmass, are recognized in the drusy cavities predominating in

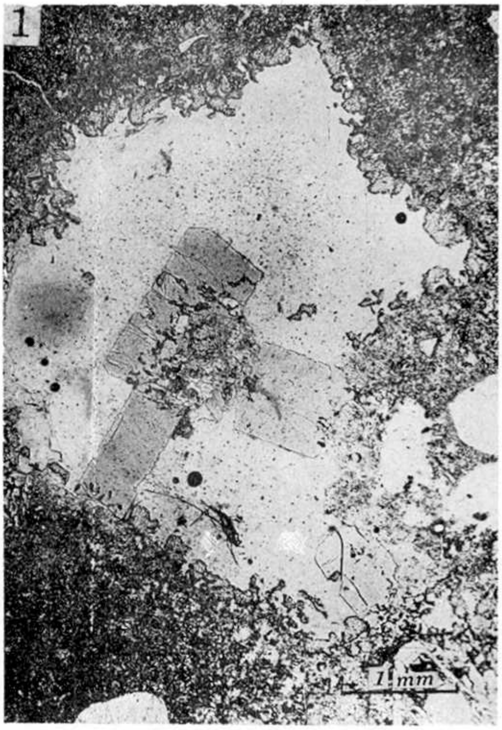


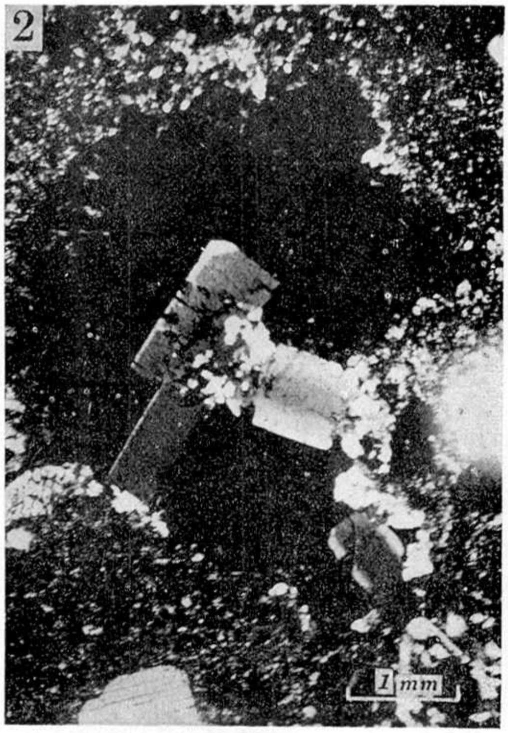
such parts of the groundmass. Parallel growth of the tabular crystals are common, but the pseudohexagonal twinning characteristic to cordierite has not been observed. In thin slices, these cordierite indicate low retardation, remarkable pleochroism (Light Glaucous Blue[6] to colourless), and distinct dispersion ($\rho > v$ about Z). Optically positive crystals with small optic angle or uniaxial positive crystals are not rare. Among the principal refractive indices, the intermediate β_D varies even in a single crystal,

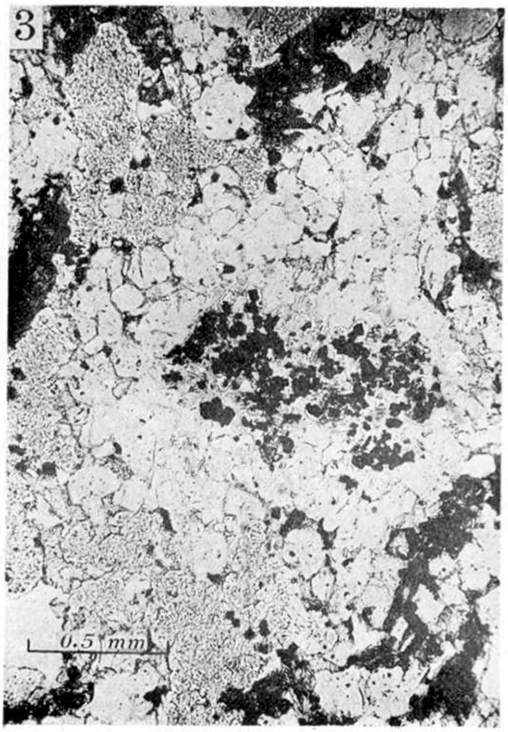
5) Occurrence of this mineral will be reported separately.

6) WADA's Colour Chart No. 131.

7) Range of the principal refractive indices measured on several individuals: $\alpha_D = 1.545\text{-}1.548$, $\beta_D = 1.546\text{-}1.549$, $\gamma_D = 1.549\text{-}1.551$ (± 0.001). Mean chemical composition of the prismatic crystals: SiO_2 50.78, TiO_2 0.01, Al_2O_3 24.85, Fe_2O_3 1.95, FeO 9.97. CaO 0.61, MnO 0.40, MgO 6.68, Na_2O 1.00, K_2O 1.42, $H_2O(-)$0.27, $H_2O(+)$1.73, Total 99.67 wt%. Anal. Hideo MINATO.







（震研彙報 第二十五號 圖版 森本）

so the optic angle is quite variable from almost uniaxial positive to biaxial negative. In the crystals microphotographed in Fig. 1-2, an optic elasticity axis Z, being an acute bisectrix in the central part of the crystals, is an obtuse one in the peripheral zone[8]. In the hard and compact parts of the rock in which no crystals of cordierite being observed, the groundmass consists of light-brownish glass of low refractive index ($n_D \doteqdot 1.48$) with scattered minute grains of iron ore dust, microlites or crystallites. Considerable existence of angular fragments of the phenocrysts in those parts of the rock where the flow structure remarkably predominates, indicates that these earlier formed crystals were broken down mechanically into smaller angular flakes by the flowing magma. According from the above-description, it will be afforded for the writer to think that the present cordierite must have crystallized out *in situ*, in other words, where we observe them now, without mechanical disturbance, from the residium at the later stage of consolidation of the magma, irrespectively of their occurrence as euhedral crystals in the drusy cavities, or as anhedral irregular formed crystals in the comparatively coarse grained groundmass. They are not found in the glassy parts of the groundmass which are the quenched product of the residual magma, or in the parts of the rock where the flow structure indicating the mechanical disturbance during its crystallization is remarkable: But they are found in the drusy cavities or in the comparatively higher crystalline parts of the groundmass, in which the considerable tridymite representing those parts of the groundmass where the volatiles were concentrated during the final stage of crystallization are observed.

Quite differently in its mode of occurrence from the above-mentioned cordierite, the mosaic aggregate of cordierite was found in the xenolith[9] included in the cordierite-bearing lava (Fig. 3-4). Occurrence of cordierite like this are common in pyrometamorphosed xenolith. There is no direct relation between these two modes of occurrence represented respectively by the cordierite in the lava and in the xenolith, though foreign assimilation in the magma might have lead to crystallization of cordierite from residual magma.

In conclusion, the writer's sincere thanks are due to Prof. Seitarô TSUBOI of this Institute for his kind guidance and help throughout this study. Special thanks are due to Mr. Hideo MINATO for his co-operation and also to Mr. Junosuke MASUTOMI for gifts of specimen.

---

8) Crystals of corierite in the druse, wall of which is covered by scaly crystals of tridymite, shagreen appearance in Fig. 1. Inclusions in cordierite are quartz.

9) Spinel-bearing cordierite-hypersthene-biotite-plagioclase-xenolith. The dark mineral grains in the central part of Fig. 3-4 are green spinel.