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MODE OF PLAGIOCLASE TWIN LAWS IN THE GRANITIC ROCKS IN THE SØR RONDANE MOUNTAINS (EXTENDED ABSTRACT)

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The twinning laws of plagioclase are useful in geology and petrology. For example, some plagioclase twins characteristically occur in typical intrusive rocks (GORAI, 1951; SUWA, 1956). The frequency of twinned plagioclase having composition plane (010) is related to the temperature in metamorphism (SUWA *et al.*, 1974) or difference of shear stress (OLSEN and KOHLSTEDT, 1985). We will present the twinning laws of plagioclase of representative Early Paleozoic granitic rocks in the Sør Rondane Mountains, and discuss the geological setting of a few bodies based upon twinned plagioclase data.

The method of determining the twinning law in our study is as follows.

(1) Determination of the composition plane

The composition plane is determined by the relation between the optical elastic axis and the composition plane. For example, in the case of low-temperature type oligoclase to andesine, when the Y axis is almost perpendicular to the composition plane, the composition plane is (001) or a rhombic section. When the Z axis is almost perpendicular to the composition plane, the composition plane is (010). The composition planes of Baveno twin are (021) or $(0\bar{2}1)$. Those planes are recognized readily because they are diagonal to the cleavages, (010) and (001).

(2) Twins having the composition plane (001) or a rhombic section

The twinning law in this case should be mostly pericline twin though this twin is not sure because the range of the rhombic section overlaps the (001) plane for plagioclase from An30 to An50 in the low-temperature type. When twinned plagioclase is simple twin and shows symmetrical extinction in any case, its twinning law is Manebach twin.

(3) Twins having the composition plane (010)

Twinned plagioclase having the composition plane (010) is divided into the albite, Carlsbad, albite-Carlsbad, Ala B, and albite-Ala B laws. These are determined by measuring the extinction angles in the zone perpendicular to (010) in neighboring twinning lamellae (SUWA *et al.*, 1974).

The following indices of twinned plagioclase are useful for discussion of metamorphism or plutonism. One is the frequency of twinned plagioclase having the compositional plane (010). This is now named the (010) ratio. A pericline twin, representative of twinning not having composition plane (010), is produced by mechanical deformation under high temperature (*e.g.* WENK, 1969). So, low (010) ratio may show the condition of higher shear stress. The other index is frequency of the C-twin. The C-twins in our study are Carlsbad, albite-Carlsbad and Ala B twins. The C-twin is frequent in igneous rocks (GORAI, 1951; SUWA, 1956). The frequency of the C-twin in twinned plagioclase is now named the C-twin ratio. The C-twin ratio in igneous rocks is more than 10–15%, while in metamorphic rocks it is less than 10–15% (Fig. 2 of SUWA, 1956).

The granitic rocks examined are Vikinghogda Granite (VIG), Mefjell Complex (MG), Lunckeryggen Granite (LG), Dufek Granite (DG), Austkampane Granite (AG) and Rogerstopane Granite (RG). They are grouped on the basis of field occurrences; migmatitic granite (VIG), concordant stock (MG) and discordant stock (LG and DG) (*e.g.* TAINOSHO *et al.*, 1993). AG is composed of some small intrusive bodies such as dike or sheet, and RG shows small exposure due to covering of the glacier.

Plagioclase twinning of Vikinghogda Granite is mostly albite twin with very minor albite-Carlsbad twin. The (010) ratio is 100% and the C-twin ratio is 0 to 4%.

The Mefjell Complex is composed of quartz monzonite and granodiorite with quartz diorite dike. Plagioclase twinning of quartz monzonite is mostly albite twin with minor of Carlsbad twin, albite-Ala B twin and pericline twin. The (010) ratio is 95% and the C-twin ratio is 10%. In granodiorite, the pericline law is most common, followed by albite twin with minor of albite-Carlsbad twin. The (010) ratio is 36% and the C-twin ratio is 4%. Plagioclase twinning of quartz diorite is mostly albite twin with minor of pericline twin. The (010) ratio is 97% and the C-twin ratio is 0%.

Plagioclase twinning in the Lunckeryggen Granite is mostly albite twin, followed by Carlsbad twin and albite-Carlsbad twin. The (010) ratio is 100% and the C-twin ratio is 10 to 17%.

Plagioclase twinning of Dufek Granite is mostly albite twin, followed by Carlsbad twin and albite-Carlsbad twin. Manebach twin is identified in one grain. The (010) ratio is 95 to 100% and the C-twin ratio is 10 to 20%.

The Austkampane Granite is a general name of various kinds of small granitic masses in Austkampane. Plagioclase twinning is investigated in both discordant granite (biotite granite dike) and concordant granite (foliated biotite granite). In both granites, albite twin is common, followed by Carlsbad twin and albite-Carlsbad twin. Albite-Ala B and pericline twins are minor. The (010) ratio is 96% and the C-twin ratio is 25% in both granites.

The Rogerstopane Granite shows rare exposure due to glacier covering, so its geological setting is unclear. Most plagioclase twinning of the granite is albite twin with small amounts of Carlsbad twin. The (010) ratio is 100% and the C-twin ratio is 8%.

The frequency of C-twin (C-twin ratio) increases with order of migmatitic granite (VIG), a concordant stock (MG), discordant stocks (LG, DG) and small intrusive (AG). GORAI (1951) and SUWA (1956) pointed out that the C-twin is more abundant in intrusive rocks than in metamorphic rocks, so the migmatitic granite and concordant stock in the

mountain may be geologically related to the surrounding metamorphic rocks. The concordant foliated granite of AG contains abundant C-twin. This suggests that the foliation of this granite may not be related to metamorphism nor deformation under high temperature. The frequency of C-twin in the Rogerstopane Granite is intermediate between metamorphic rocks and intrusive rocks, which suggests that this granite occurs as concordant stock like MG.

The (010) ratio of the granodiorite in the Mefjell Complex is smaller than that of the other granitic rocks in the mountain. This granodiorite should have been subjected to higher shear stress than the others.

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