Growth Condition of Plagioclase Porphyroblasts in Sambagawa Schist from Central Shikoku, Japan

By

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with 2 Text-figures and 2 Plates

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ABSTRACT: Microtextures of plagioclase porphyroblasts in a fold of pelitic schist in the biotite zone of the Sambagawa belt of Central Shikoku, Japan, have been described. It has been clarified that the growth of plagioclase porphyroblasts occurred as mimetic crystallization after the folding and under non-deformational condition.

CONTENTS

I. INTRODUCTION

Plagioclase of schists in the biotite zone of the Sambagawa belt of Central Shikoku, Japan, develops commonly as porphyroblasts which contain other metamorphic minerals as inclusions (HARA *et al.*, 1977). The plagioclase porphyroblasts, except for their outermost zones, appear to have grown during progressive increase of temperature until the highest temperature (TAKAGI and HARA, 1979; MAEDA and HARA, 1983; HARA *et al.*, 1983). TAKAGI and HARA (1979) and MAEDA and HARA (1983) have also pointed out that the plagioclase porphyroblasts grew under non-deformational condition. Microtextures of plagioclase porphyroblasts in a fold of pelitic schist, which has been collected from an outcrop (Besshiyama-mura, Nikubuchi) in the biotite zone of the Sambagawa belt of Central Shikoku, will be described in this paper. The obtained data will clearly indicate that the plagioclase porphyroblasts grew under non-deformational condition.

II. ANALYSIS OF MICROTEXTURES OF PLAGIOCLASE PORPHYROBLASTS

The fold (B_1-fold) of pelitic schist, in which growth condition of plagioclase porphyroblasts will be examined in this paper, is defined by schistosity of a single set (S) (Plate 13) and is of the type of rootless intrafolial fold. It shows tight form (Plate 13) and its axial surface is parallel to the schistosity S of surrounding schists. On the fold limbs S is approximately straight, while on the fold knees S shows micro-folds as axial-plane cleavage.

S is defined by preferred dimensional orientation of white mica and opaque minerals under microscope (Plate 13). Plagioclase and epidote both develop as porphyroblasts. They on the fold limbs show lens-like shapes whose longest axes are preferentially oriented parallel to S. While they on the knees of micro-folds show commonly irregular shapes and their longest axes are not always oriented parallel to S (Plate 14 and Fig. 1).

Inclusion minerals in epidote porphyroblasts show preferred dimensional orientation forming a single set of schistosity (S_1) and they in plagioclase porphyroblasts, except for epidote grains, do also it (Plate 14). Epidote grains in plagioclase porphyroblasts are much coarser-grained than other inclusion minerals and show irregular shapes. They contain also other metamorphic minerals as inclusions which show preferred dimensional orientation forming a single set of schistosity (S_{1-e}). TOKUDA and HARA (1983) have pointed out that microtextures of epidote grains in plagioclase porphyroblasts of schists in the biotite zone of the Sambagawa belt of Central Shikoku can be divided into two types, Type I and Type II: Type I) epidote grains have a preferred lattice and dimensional orientation and do not commonly have S_{1-e}, and Type II) epidote grains have irregular shapes and S_{1-e}, which continues into S_1 in matrix plagioclase porphyroblasts, and do not have a preferred lattice orientation. The epidote fabric of the present specimen is of the Type II after TOKUDA and HARA (1983).

S_1 in plagioclase porphyroblasts and epidote porphyroblasts on the fold limbs is commonly approximately straight and parallel to S of matrix (Plate 14–a and Fig. 1). S continues into S_1. While S_1 in them on the fold knees show commonly fold form which is harmonic with that of S of matrix, i.e. S continues into S_1 (Plate 14–b and Fig. 1).

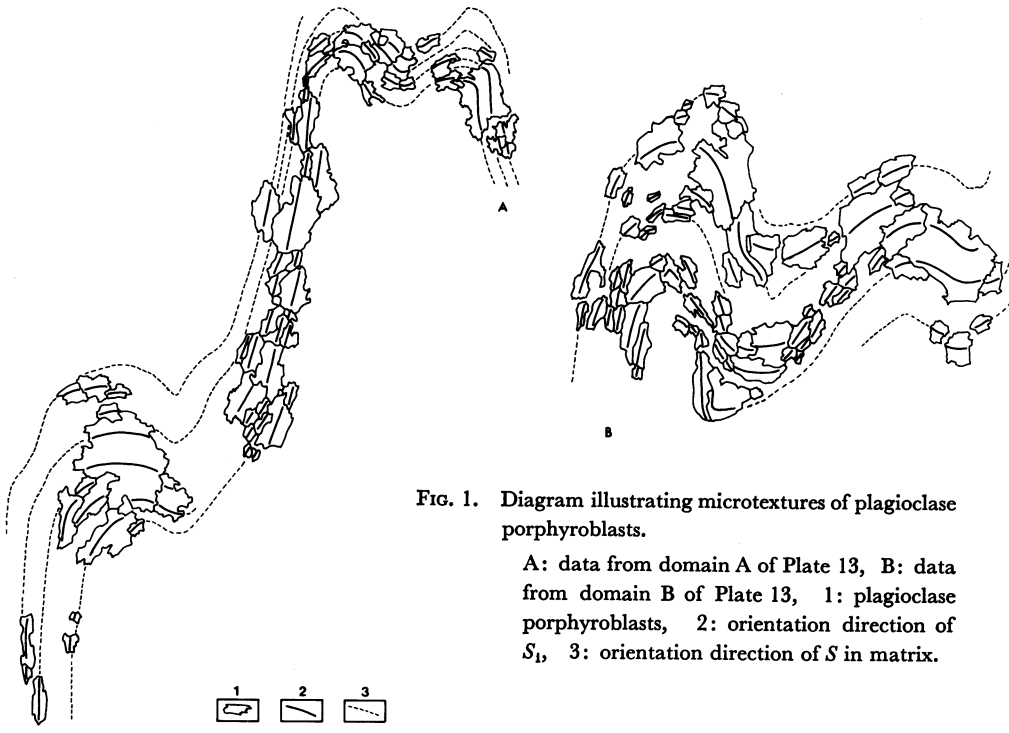

FIG. 1. Diagram illustrating microtextures of plagioclase porphyroblasts.
A: data from domain A of Plate 13, B: data from domain B of Plate 13, 1: plagioclase porphyroblasts, 2: orientation direction of S_1, 3: orientation direction of S in matrix.

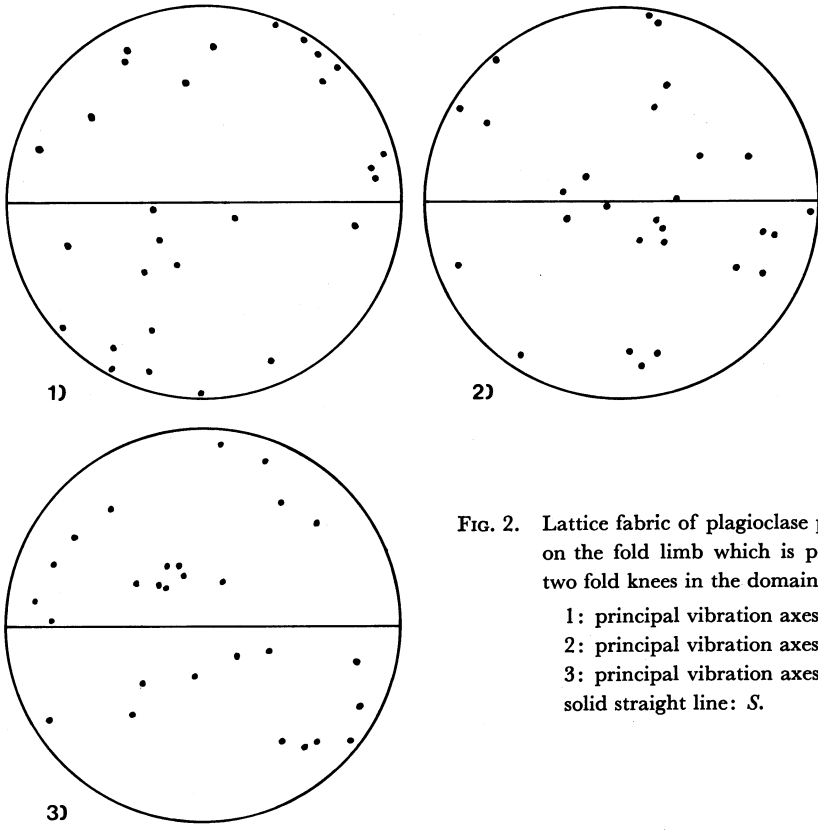

FIG. 2. Lattice fabric of plagioclase porphyroblasts on the fold limb which is placed between two fold knees in the domain A of Fig. 1.
1: principal vibration axes X,
2: principal vibration axes Y,
3: principal vibration axes Z.
solid straight line: S.

Fold forms of S_1 are found only where S is folded, both S_1 and S forming the same microfolds. Thus, it is clear that both plagioclase porphyroblasts and epidote porphyroblasts grew after the folding of S (=formation of B_1-fold) and included the B_1-fold.

Lattice fabric of plagioclase porphyroblasts, which occur on an approximately straight fold limb and in which S_1 is parallel to each other and to the approximately straight S of matrix (Fig. 1), has been analysed. The result is shown in Fig. 2. Plagioclase porphyroblasts do not have a preferred lattice orientation. As mentioned in the preceding paragraph (Fig. 1), plagioclase porphyroblasts and epidote porphyroblasts on the fold limbs are dimensionally preferentially oriented and S_1 in them is oriented along S, while they on the fold knees show irregular shapes but S_1 in them is oriented along S. Thus, it could be said that growth of plagioclase porphyroblasts and epidote porphyroblasts occurred as mimetic crystallization after the B_1-folding and under non-deformational condition. The present data is quite comparable with that of MAEDA and HARA (1983). The B_1-folding of the present specimen must be of the same generation as that of MAEDA and HARA's specimen.

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EXPLANATION OF PLATE XIII

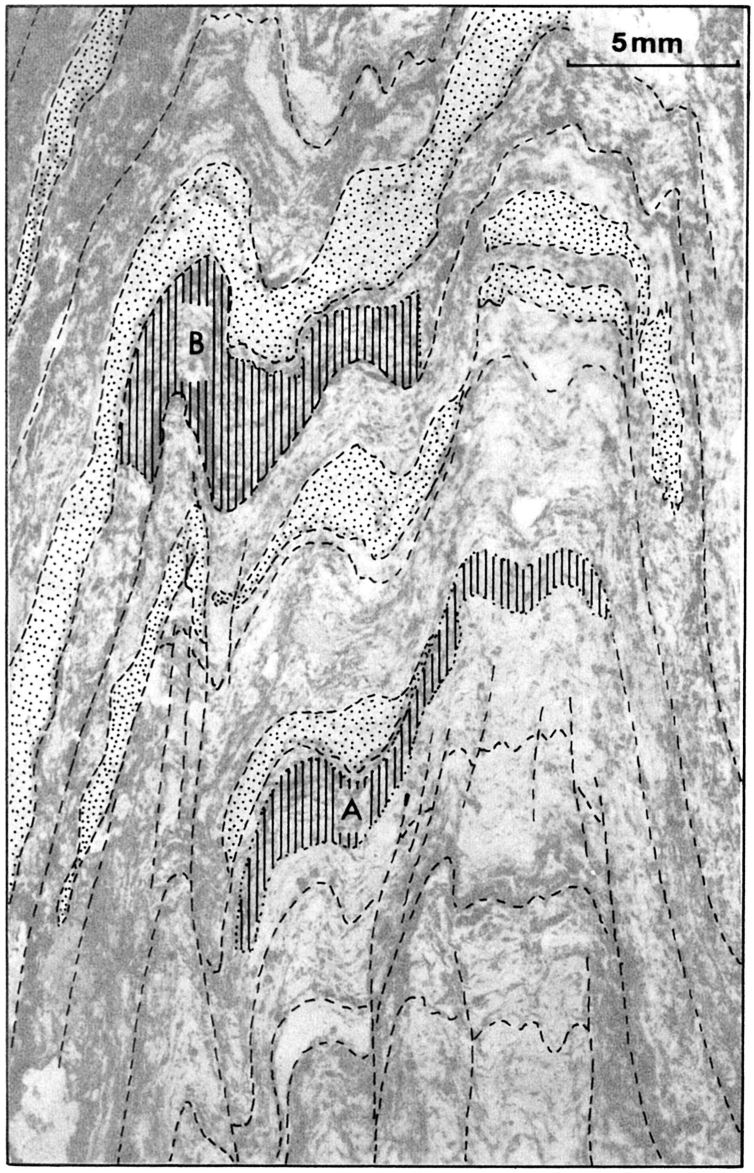
Microphotograph of the fold of pelitic schist in which microtextures of plagioclase porphyroblasts have been described in this paper.

A: domain A from which the data of Fig. 1–A has been obtained. B: domain B from which the data of Fig. 1–B has been obtained.

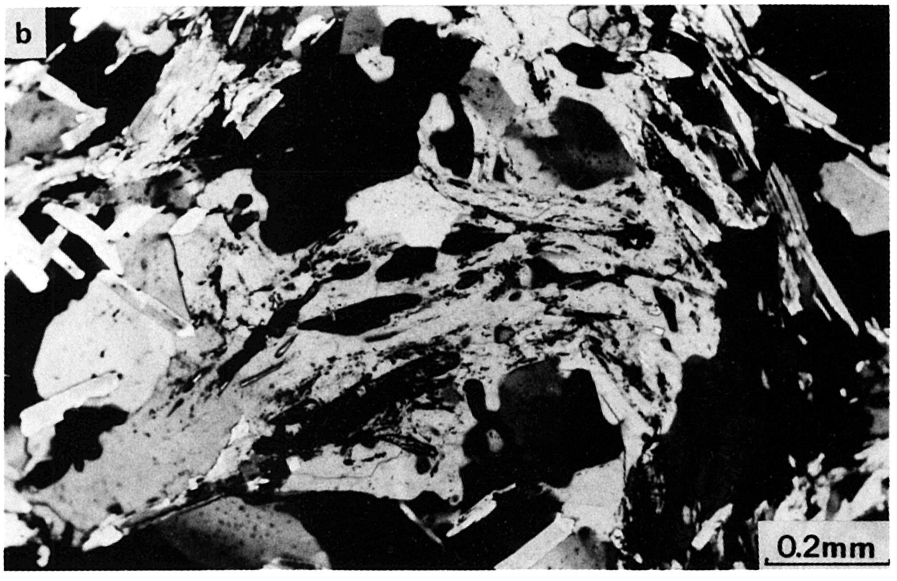
EXPLANATION OF PLATE XIV

a) Microphotograph of plagioclase porphyroblasts on the fold limb. under crossed nicols.

b) Microphotograph of plagioclase porphyroblasts on the fold knee. under crossed nicols.


5mm
B
A


a
0.2mm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