

## **Fluorite particles inducing butterfly aggregates of incipient microperthite in alkali feldspar from a syenite, the Patagonian Andes, southern Chile**

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### **ABSTRACT**

Alkali feldspar grains found in a syenite from the Patagonian Andes, southern Chile, have bulk compositions of about  $\text{Or}_{40}\text{Ab}_{59}\text{An}_{0.5}$ , and consist of two parts when viewed under an optical microscope: a clear part and a turbid part. Grain interiors are mixtures of the two parts, whereas the rims are mainly turbid. The microscopically clear part, which is almost free of micropores, is cryptoperthitic, whereas the turbid part is microperthitic. The microperthite is of the patch type, and the turbidity is due to abundant micropores that are polygonal and generally less than  $1\ \mu\text{m}$  in diameter. The patch microperthite has been formed by coarsening of primary cryptoperthite by hydrothermal reactions. An incipient stage of the microperthite formation is recorded as the segregation of the Or-rich feldspar with diagonal elongation and Ab-rich feldspar into aggregates that have a “butterfly” shape. Each butterfly aggregate of microperthite is generally less than  $10\ \mu\text{m}$  in length. The centers of the butterfly aggregates are usually occupied by round fluorite particles about  $1\ \mu\text{m}$  in diameter, which were identified by EPMA and TEM analyses. The fluorite particles may have been formed at the fluid stage. The microperthite formation may have started as butterfly aggregates along the interfaces with the fluorite particles at the hydrothermal stage. The butterfly aggregates have changed to patch microperthite with further coarsening. The timing and process of the formation of the fluorite particles are important in relation to the evolution of feldspar microtextures, and the behavior of fluorine in alkaline igneous rocks.