

Microtexture investigation of amblygonite–montebrasite series with lacroixite: Characteristics and formation process in pegmatites

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ABSTRACT

Amblygonite–montebrasite series and lacroixite from Nagatare Li–Cs–Ta (LCT) pegmatite, Fukuoka Prefecture, Japan, were investigated by powder X-ray diffraction (XRD), electron microprobe analyses, and transmission electron microscope (TEM)/scanning transmission electron microscope (STEM) analyses. Scattered patchy or lamellar lacroixite was contained in montebrasite and amblygonite in all observed specimens. TEM/STEM observations revealed that the patchy and lamellar texture comprised lacroixite and low-fluorine montebrasite having same crystal orientations as that of host montebrasite and the boundaries corresponded to well-developed {110} planes. The observed microtexture was newly discovered, and it is an important evidence of the exsolution process. In XRD experiments conducted at high temperature, the unit-cell parameters of amblygonite were closer to that of monoclinic structures such as lacroixite with increasing temperature. Results suggested that scattered patches or lamellae of lacroixite were exsolution textures from a high-temperature phase.

Montebrasite and amblygonite specimens from other localities involved varying textures corresponding to their occurrence. The amblygonite–montebrasite series from petalite-bearing pegmatite included low to high lacroixite contents and that from lower-temperature pegmatite with spodumene either did not possess or involved low lacroixite contents. Gem-quality montebrasite from drusy vugs formed at low temperature did not include any exsolution texture or lacroixite. The variety of texture of the amblygonite–montebrasite series indicated in this study generated new possibilities as the indicator of pegmatite-forming process.

Keywords: Amblygonite–montebrasite series, lacroixite, exsolution, Nagatare pegmatite, TEM