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Plagioclase alteration in anorthositic wall rocks surrounding eclogite facies pseudotachylites

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Plagioclase within the wall rock of eclogite facies pseudotachylites contains microstructures that may be unique to deep-seated earthquakes. The Bergen Arcs of western Norway are made up of partially eclogitized granulite terranes that were exhumed from depths of ∼55 km in the Caledonian collision zone. Pseudotachylites found within the granulite consist of a predominant matrix of omphacite (XJd $\sim$ 0.23) and kyanite with grossular-rich garnet (XGrs $\sim$ 0.21) and local zoisite, phengite and amphibole. Plagioclase dominates the granulite mineralogy (XAn $\sim$ 0.38) and is partially altered along grain boundaries, planar fractures and cleavage planes. The alteration is observed as < 30 μm clusters of alkali feldspar and zoisite scattered along grain boundaries and throughout the grains, with kyanite, labradorite (XAn $\sim$ 0.60), oligoclase (XAn $\sim$ 0.20) and quartz within planar fractures, and individual zoisite needles along cleavage planes. Within the planar fractures a mosaic structure is observed with an interconnected network of labradorite separating < 5 μm polygons of oligoclase. Kyanite needles are also occasionally observed as sets of parallel lamellae that emanate from the planar fractures. These microstructures are characterized by electron backscatter diffraction. Thermodynamic modelling indicates that the wall-rock assemblage kyanite-quartz-zoisite-K-feldspar formed from more saline fluids (aH_2O<0.1) than the fluids involved in the formation of phengite-bearing assemblages in the pseudotachylites. The evidence gained from detailed geochemical and microstructural analyses of plagioclase within these rocks may provide new tools for recognizing lower crustal earthquakes.