



From granulite hydration to metamorphic differentiation: Evolution of a shear zone.

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The studied outcrop, located within the Bergen arcs of southwestern Norway, preserves the hydration of an anorthositic granulite at amphibolite-facies conditions. The amphibolite-facies hydration is expressed as both a statically hydrated amphibolite and a shear zone rock, defined by the interlayering of amphibolite with leucocratic domains. Within the outcrop, quartz-filled fractures and their associated amphibolite alteration haloes crosscut the granulite. These fractures are relicts of the initial fluid infiltration event. The fracture assemblage (quartz + plagioclase + zoisite + kyanite ± muscovite ± biotite) is equivalent to that occurring locally within leucocratic domains of the shear zone. Due to the textural and compositional similarities between quartz-filled fractures and leucocratic domains, the compositional layering of the shear zone rock may be directly linked to fracturing during initial fluid infiltration. Mass-balance calculations indicate quartz-filled fractures and compositional differentiation of the shear zone form by internal fractionation rather than partial melting or precipitation of minerals from an eternally derived fluid. This inferred fluid connectivity combined with the enhanced local dissolution indicates the presence of a continuously replenished fluid along fracture pathways. The overall conclusion is that the mass transfer processes that result in metamorphic differentiation of the shear zone lithologies are dependent on both continuous fluid flux and heterogeneous strain distribution.