



## **Preservation of prograde zonation in UHP garnets: Mechanically-controlled microstructure or sluggish kinetics?**

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Garnets from the Western Gneiss Region (WGR) experienced Caledonian ultra-high pressure (UHP) metamorphism with peak metamorphic conditions around 800°C at 3.2GPa, and a post-UHP amphibolite-facies overprinting during exhumation. Garnets from this region preserve prograde chemical zoning, despite being exposed to high temperature during slow subduction and exhumation of the WGR. Current knowledge on chemical diffusion rates in garnet may not be enough to explain the preservation of zonation in these garnets because at the million-year time scale it predicts complete chemical re-equilibration at such high temperature. Interestingly, when chemical diffusion is relatively fast, the development and preservation of compositional zoning in minerals can be strongly influenced by mechanically maintained pressure variations.

Here, we compare the application of conventional diffusion methods with the newly developed unconventional quantification methods to understand the preservation of chemical zoning in these garnets. We also discuss how to distinguish such mechanically- and chemically-controlled microstructures