

Titanite and zircon U-Pb ages from West Uusimaa complex, Finland, and implications to titanite geochronology

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Five pyroxene granulites from extensional shear zones within West Uusimaa Complex (WUC), and a mylonite sample from the lower-grade, mostly strike-slip Karkkila-Somero shear zone (KSSZ) were dated with titanite and zircon. The peak metamorphic conditions in the WUC are c. 700-825°C and 3-5 kbar. The PT conditions of the mylonitic phase of the KSSZ are undetermined but are approximately in the lower amphibolite facies. All of the samples with zircon in them show a large spread of inherited ages, mainly Paleoproterozoic (ca. 2.0-1.9 Ga) but also a prominent Archean component. Generally, this corresponds to the age distribution in Svecofennian detrital zircon suggesting that all samples are of predominantly sedimentary origin.

The zircon ages tend to have two maxima, one at an older, early Svecofennian (~1.9 Ga) range (zircon cores) and a younger one at 1825-1805 Ma (zircon rims). The younger ages are interpreted to represent metamorphic growth at the time of deformation along the shear zones. Titanite yields slightly older ages than the younger zircon rims in the three samples that are from extensional shear zones. This is somewhat surprising as titanite is usually considered to be a more reactive mineral compared to zircon, and in our samples displays euhedral, metamorphic crystal habit. However, a SEM examination reveals that the titanites are often somewhat heterogeneous, probably due to deformation and/or prograde metamorphism: the titanites seem to have retained older material and, although heterogeneous parts were avoided in the age determinations, the ages of these titanites are probably mixed ages. The implication is that titanites may not re-equilibrate as completely and fast during deformation and metamorphism as often assumed. It is uncertain whether this is a common phenomenon, but the high Ca-content of the host rock may be important. A routine SEM or similar microanalytical investigation of titanites should perhaps be undertaken in all geochronological studies using titanite, in order to recognise inherited material.