EMP chemical age dating of monazites from a complex terrain: the Paleo-Proterozoic of Broken Hill, Australia

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A regional program of EMP age-dating has been undertaken on samples, chiefly from meta-sediments, covering all groups in the stratigraphy [1], main metamorphic assemblages and HT and LT shears (ca. 80 specimens, ca. 3000 spot ages). A cumulative plot of the spot (and isochron) ages reveals two concentrations: 1) a broad peak ca. 1720 to 1600 Ma and 2) twin peaks at ca. 520 & 480 Ma. All are independent of the position of the specimen in the stratigraphic sequence. The high grade metamorphic rocks and mylonites in 1) are characterized by any or all of the And, fibrolite (Fib) and Sil minerals. Texturally, on a regional basis, And is overprinted by Fib which is overprinted by at least two generations of prismatic Sil. The age spread 1) is thought to reflect the above textural complexity. Fib is often included in monazites within this age-peak, including those with ages of circa 1720 Ma. Monazite cores with ages in the older part of 1) are often rimmed by overgrowths in the younger part which concentrate in mylonites. A protracted thermo-tectonic event is indicated. Samples with monazites from the 520 & 480 Ma peaks have St + Ky ± Cld assemblages and are found mainly, but not exclusively, in retrograde shear zones. These monazites may be new grains or rim the older ones. All monazites corrode/alter when positioned in Bt-Chl-Ms-Ab assemblages. Monazites included in Qtz, Fsp or Grt may retain older ages, some older than 1720 Ma and which may be due to older metamorphic rocks.

The spread of ages from 1720-1600 Ma is basically similar to that seen in the zircon-geochronology from the area [2]. This spread supports a thermo-tectonic origin [3] rather than one also involving deposition [4].

References

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