

DIACHRONOUS UHP METAMORPHISM IN THE KOKCHETAV MASSIF

RUBATTO, D. ¹, KORSAKOV, A. ², HERMANN, J. ¹, & DOBRESTOV, N. L. ²

¹Research School of Earth Sciences, The Australian National University, Mills Road, Canberra 0200, Australia

²Institute of Mineralogy and Petrography SB RAS, Koptyug Pr. 3, Novosibirsk 630090, Russia
e-mail: daniela.rubatto@anu.edu.au

The Kokchetav massif consists of two UHP blocks: the diamond-bearing Kumdy-Kol (4 - 6 GPa, 950 – 1000 °C) and the coesite-bearing Kulet (3.8 - 4.0 GPa, 650 – 700 °C). Extensive geochronological work on the diamond-bearing unit established an age of 528 - 530 Ma for the UHP peak, whereas only a few scattering Ar-Ar ages were produced for the Kulet area, where no information is available on the time of the metamorphic peak.

Garnet-kyanite-micaschists from Kulet have been investigated to determine the conditions and age of metamorphism. Textural observations suggest that the peak metamorphic assemblage garnet + phengite + kyanite + coesite ± jadeite + rutile records pressures of 3.8 - 4.0 GPa at temperatures of maximum 730 °C. A first sample contains garnet porphyroblasts with polycrystalline quartz inclusions, which together with the composition of phengite are indicators of UHP metamorphism. The garnet displays a bell-shaped zoning in Mn and a U-shaped zoning in Mg, which are in line with prograde garnet growth. A sharp core-rim zoning in trace element (Y and HREE) is also observed. Monazite recovered from this sample contains inclusions of kyanite, phengite and rutile. It displays limited zoning in back-scattered electron imaging, whereas it is homogeneous in REE composition. It has a typical REE pattern strongly enriched in light with respect to heavy rare earth elements and a small negative Eu-anomaly. Partitioning of trace elements between monazite and garnet compared to previous works (HERMANN & RUBATTO, 2003) suggest equilibrium between monazite and the UHP garnet rim. Monazite was dated by SHRIMP ion microprobe at 500 ± 3 Ma (95% c.l.).

A second sample contains garnet with coesite and widespread polycrystalline quartz inclusion. Monazite in this sample forms symplectite-like aggregates with apatite and phengite. These symplectites are likely to be the product of breakdown of an UHP phase, most probably bearthite, as previously described in the Dora Maira whiteschists (SCHERRER et al., 2001). U-Pb dating of monazite yielded scattered ages partly due to the small grain size and contamination from apatite. The major population defines an age of 508 ± 6 Ma (2σ).

The ages of both monazite populations are indistinguishable within error, but significantly younger than the age of the zircon formed at the UHP peak and in the Kumdy-Kol, diamond-bearing rocks. Together with the different metamorphic conditions recorded in the two areas, and published Ar-Ar and U-Pb data, there is enough evidence to suggest a diachronic UHP metamorphism between the Kulet (lower grade and younger) and Kumdy-Kol (higher grade and older) unit.

References

- HERMANN, J. & RUBATTO, D. (2003): Relating zircon and monazite domains to garnet growth zones: age and duration of granulite facies metamorphism in the Val Malenco lower crust. *J. Metam. Geol.* 21, 833-852.
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