

**LINKING U-Pb SHRIMP ZIRCON AGES WITH METAMORPHIC CONDITIONS:
CONSTRAINTS FROM THE REE COMPOSITION OF ZIRCON IN
ALPINE (U)HP ROCKS OF THE RHODOPE, N' GREECE**

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Zircon (re)crystallization during metamorphism cannot, generally, be directly linked to a certain stage during P-T-t evolution. However, long-lasting observations based on cathodoluminescence-controlled SHRIMP-dating of zircon from (U)HP/HT rocks worldwide show that zircon starts recrystallizing at (or above) T of the upper amphibolite- or high-T (ca. > 650 °C) eclogite-facies (e.g., LIATI & GEBAUER, 2003). However, the link between time of metamorphism and metamorphic conditions of zircon formation can be substantiated also by using the REE composition of metamorphic zircon domains: The REE composition of zircon reflects the concurrent growth of index metamorphic minerals, such as feldspars (causing negative Eu anomaly) or garnet (causing depletion in HREE).

We analysed for REE by LA-ICPMS (ETH, Zurich) and by SHRIMP II (ANU, Canberra) metamorphic zircon domains (already dated by SHRIMP) from different (U)HP rocks in Central (CR), West (WR) and East Rhodope (ER): In CR (Thermes area), the ca. 42 Ma old metamorphic zircon domains of both eclogites and orthogneisses show no Eu anomaly, implying absence of plagioclase and thus HP conditions, while the HREE profile of the eclogite zircons is flat, which is compatible with concurrent garnet growth. The ca. 40 Ma old leucosome zircons of migmatized orthogneisses in the same area are characterised by lacking or weak Eu anomalies, thus indicating leucosome formation still at HP. Metamorphic zircon rims of grt-ky paragneisses (N' of Xanthi) dated at 152.8 ± 2.4 Ma (LIATI, submitted to CMP) grew probably also under HP (or UHP) and in the presence of garnet, as indicated by the absence of Eu anomalies and flat HREE patterns. The same is true for similarly old amphibolitized eclogites from the same area. In WR (close to Sidironero), 51 ± 1 Ma old metamorphic zircon rims of eclogites show again no Eu anomalies and a flat HREE pattern, compatible with formation at HP and garnet presence. Finally, in ER (Kimi area) 117.4 ± 1.9 Ma old magmatic domains and 73.5 ± 3.4 Ma old metamorphic domains of zircon in UHP mafic rocks show weak and no Eu anomalies, respectively, as well as steep HREE patterns, which indicates the presence of a trace element supply rich in HREE, during metamorphism.

Our data on the REE composition of zircon from (U)HP/HT rocks of Rhodope confirm the empirical observation that metamorphic zircon rims form close to both P-peak and T-peak. This follows from the usually fast rates of exhumation in (U)HP terranes ($> 1 - 2$ cm / a), which imply a relatively short time difference between T and P peak. Identification of four Alpine (U)HP events in the Rhodope argues for the presence of different micro-continents rifted off from Gondwana and participating in distinct subduction and collision cycles during Alpine orogeny.

Reference

LIATI, A. & GEBAUER, D. (2003): Schweiz. Mineral. Petrogr. Mitt. 83, 159-172.