

Timing and magma evolution in Medet Cu-porphyry deposit, SE Europe: controversial or coinciding isotope data?

I. PEYTICHEVA^{1,2}, A. VON QUADT¹, R. NEDYALKOV³,
C.A. HEINRICH¹ AND M. FRANK¹

¹ IGMR, ETH-Zurich, 8092, peytcheva@erdw.ethz.ch

² CLMC-Bulgarian Academy of Sciences, Sofia, Bulgaria

³ Faculty of Geology and Geography, Sofia University, BG

Europe's world-class Cu-porphyry and Au-epithermal deposits are hosted by an elongated belt of intensive Late Cretaceous magmatic activity. The Medet copper deposit - Bulgaria's first known porphyry type deposit is situated in the central part of the Srednogie zone and linked with this belt. New isotope-geochronological data, added during the activity of the GEODE project of ESF help the better understanding of ore forming processes, but some data seem controversial. Former K-Ar ages range from 90-88 Ma for the ore-related Q-monzodiorite to 88-87 Ma for the K-silicate alteration. ⁴⁰Ar-³⁹Ar studies of "igneous Bi" mark intrusion age of 90.4 ± 0.9 or date Hbl from a granodiorite sample as 85.7 Ma, and white mica (sericite) reveal plateau ages of 79.0 ± 0.8 Ma to 79.5 ± 0.7 Ma (Lips et al., 2004; Handler et al., 2004). Questionable are also the sources of the magma.

For present study, we combined the time succession inferred from field relationships of the magmatic rocks, hydrothermal alteration and ore bodies with precise U-Pb zircon dating of the magmatic rocks and Re-Os molybdenite ages. Hf-zircon and Sr-Nd WR characteristics constrain the magma sources. The Medet gabbro is 305.6 ± 0.5 Ma and together with the host Smilovene (305.3 ± 1.3 Ma) and Koprivshitsa granitoids belong to the Palaeozoic basement. The Upper Cretaceous magmatism started with the intrusion of Q-monzodiorite porphyry at 90.36 ± 0.48 Ma and the almost contemporary Pl-Hbl granodiorite porphyry at 90.47 ± 0.30 Ma and was generally accomplished at 90.12 ± 0.36 Ma, when the zircons of a crosscutting aplitic vein in the granodiorite crystallized. These data coincide with Re-Os molybdenite ages of 90.3-90.5 Ma. Inherited zircon grains and cores are Lower Palaeozoic (456.5 ± 5.5 Ma or older), whereas Variscan input was negligible. The ε-Hf zircon values (corrected for 90 Ma) of the Cretaceous shallow intrusion range from +1.4 to -0.9 and are close to zircons with lead inheritance (from +2.9 to -2.3). These data define the lower and middle crust as source material, which was mixed with enriched mantle magma prior to crystallisation of the zircons. The time span of fertile magmatism in Medet deposit was less than 1 Ma, consequently K-Ar and Ar-Ar younger aging of alteration minerals has to be linked to low-temperature fluids and higher thermal gradient caused by deep magma chambers or to possible still not studied dykes.