

Mn-oxyhydroxide U-Pb dating of meteoric water infiltration

I. DUNKL¹, H. VON EYNATTEN¹, J. LORENZ², K. LÜNSDORF¹,
V. KARIUS¹

¹Sedimentology and Environmental Geology, Geozentrum,
University of Göttingen, Goldschmidtstrasse 3, D-37077
Göttingen, Germany, istvan.dunkl@geo.uni-goettingen.de

²Graslitzer Str. 5, D-63791, Karlstein a. Main, Germany,
Jo.Lorenz.Karlstein@t-online.de

At the eastern rift shoulder of the Upper Rhinegraben in Central Europe, Lower Permian rhyolite of the Spessart Mountains contains multiple vein generations. A part of them is of hydrothermal origin and is composed of different carbonate minerals (calcite, rhodochrosite, Ca-kutnohorite), but small amounts of fluorite, barite and anhydrite are also present. Another type of vein filling association is characterized by braunite, manganite and hematite. Fusswinkel et al. [1] distinguished more primary stages related to an unconformity-related Mn-Fe-As-vein mineralization and identified also paragenesis that developed by alteration processes.

(U-Th)/He dating of Mn-oxyhydroxide phases and hematite as well as illite K/Ar dating yielded mostly Jurassic and Early Cretaceous ages ranging from approx. 160 to 130 Ma [2]. Our new laser ablation hematite U-Pb age of 149 ± 7 Ma matches well with the earlier age constraints determined by other methods and confirms the mid Mesozoic age of the hydrothermal activity. However, U-Pb dating of the U-rich Mn-oxyhydroxide phases yields considerably younger ages. The lower intercept ages are well reproducible and distinguishable in different zones of the fine-grained, partly botryoidal Mn-minerals. In these zones the U-Pb ages consequently decrease from ~ 12 to ~ 7 Ma towards the external surface.

The young Mn-oxyhydroxides partly show replacement textures after former carbonate crystals. According to the age and their appearance we interpret this generation of Mn-minerals as Late Miocene alteration products formed from the primary veins by descendent, oxidative, meteoric fluids.

[1] Fusswinkel, Wagner, Wenzel, Wälle & Lorenz (2013) *Ore Geology Reviews* 50, 28-51.

[2] Hautmann, Brander, Lippolt & Lorenz (1999) *J. Conf. Abstr.* 4, 769.