

### **Alteration Zoning and Exploration Implications in the Freiberg Pb-Zn-Ag Epithermal Vein System, Germany**

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The Freiberg district is a prime example of an epithermal precious and base metal deposit of Late Paleozoic age in Europe. The origin of magmatic-hydrothermal vein-hosted mineralization is related to felsic magmatism in the aftermath of the Variscan Orogeny. Whilst the infill of the ore-bearing veins has been the focus of various extensive studies, there is still very little known about the effects and the footprint of hydrothermal alteration on the wall rocks. This study offers detailed petrographic and mineral chemical data of hydrothermally altered host rock from vein selvages in different parts of the Freiberg district. It is combined with Ar-Ar age data of muscovite (sericite) that occur in both altered host rock and as vein infill. Results suggest the presence of a complex interplay of sericitic, chloritic and silicic alteration of the host rock in relation to the epithermal mineralizing event. Coarse crystalline muscovite from within mineralized veins, and fine crystalline sericite from the alteration halo, yielded Ar-Ar ages ranging from  $316.7 \pm 3.2$  to  $306.8 \pm 3.1$  Ma. These ages are older than the previously reported age of  $276 \pm 16$  Ma (Rb-Sr dating on sphalerite), yet are in excellent agreement with reported cross-cutting relationships and recent ages suggesting at least two rhyolite magma pulses in the district (between 326 and 297 Ma). Other experiments yielded anomalously old ages attributed to excess argon. This study provides further evidence for the complex relationship between geodynamic evolution, felsic magmatism and the formation of hydrothermal ore deposits in the Erzgebirge.