

Application of in-situ calcite U-Pb dating in Mississippi Valley-Type Pb-Zn deposits

Kai Luo¹, Alexandre Cugerone²

¹Yunnan University, Kunming, China, ²University of Geneva, Geneva, Switzerland

Direct dating of Mississippi Valley-type (MVT) Pb-Zn mineralization remains difficult because suitable minerals for geochronology are rare. Here we report in situ LA-ICP-MS U-Pb ages of carbonate host rocks and hydrothermal calcite from the giant Jinding Zn-Pb deposit in SW China, the world's second-largest MVT system. U-Pb dating indicates that limestone clasts in the ore-hosting breccia yield an age of 216.5 ± 3.6 Ma, whereas the host limestone gives 96.9 ± 8.2 Ma, consistent with Triassic and Cretaceous seawater Sr isotopic compositions. Paragenetic observations identify two generations of hydrothermal calcite. The syn-ore calcite, coeval with sphalerite and galena mineralization, yields a U-Pb age of 88.0 ± 4.0 Ma, providing a direct constraint on the timing of Pb-Zn mineralization at Jinding. In contrast, post-ore calcite records a younger age of 51.2 ± 1.0 Ma. These results indicate that mineralization occurred during a Late Cretaceous fluid-flow event, whereas later hydrothermal activity likely reflects tectonothermal processes related to the Indo-Eurasian collision.