

Yanshanian Pb-Zn Mineralization at the Baiyinnuoer Deposit, Chifeng, Inner Mongolia: Evidence from Geochronology and Geochemistry

Pengfei Zhang,* Xiaojun Zhang, Shengsheng Xue, Ying Qin, and Yiwen Wei

China University of Geosciences (Wuhan), Wuhan, Hubei Province, China, *e-mail,
zpf2005101@126.com

The Baiyinnuoer Pb-Zn deposit, located in the southern part of the Greater Hinggan Mountains, is within the Huanggangliang-Ganzhuermiao metallogenic belt that was strongly influenced by the superimposed Paleozoic paleo-Asian ocean tectonic domain and the Mesozoic circum-Pacific tectonic domain. Polymetallic deposits in this belt mainly formed in Late Permian-Triassic (Hercynian-Indosinian epoch) and Late Jurassic-Early Cretaceous (Yanshanian epoch), and most of the deposits are closely related to granitoids. Many workers have suggested that the Baiyinnuoer Pb-Zn deposit is associated with granodiorite (locally called a diorite porphyrite at the mine) that was emplaced in the Indosinian epoch at 244.5 ± 0.9 Ma. However, some researchers indicated that the Pb-Zn mineralization may be related to Yanshanian volcanism, although there is not geochronological data to support this opinion.

Our field investigation indicates the contact zones between rhyolite tuff and marble contains skarn with massive, vein, and disseminated Pb-Zn mineralization and lenticular orebodies, showing a close spatial relationship between the Pb-Zn mineralization and volcanic rocks in southern part of the Baiyinnuoer deposit. The LA-ICP-MS zircon U-Pb dating of tuff rhyolite yields a Yanshanian crystallization age of 142.2 ± 1.6 Ma. The Pb isotope measurements of galena and sphalerite from the ores fall in different areas showing two parallel lines in $\Delta\gamma$ - $\Delta\beta$ and V1-V2 diagrams, which indicates the Pb-Zn mineralization at the Baiyinnuoer deposit is probably associated with two magmatic events developed separately in the Indosinian and Yanshanian epochs. Furthermore, the Pb isotope composition of the rhyolite tuff shows a close relationship with ores, suggesting the rhyolite tuff and ores probably originated from the same source. A large number of Pb-Zn deposits formed in the Yanshanian epoch in the Huanggangliang-Ganzhuermiao belt, such as the Haobugao Pb-Zn skarn deposit (molybdenite Re-Os isochron age of 141.5 ± 0.7 Ma), Dajing Sn-Cu-Pb-Zn polymetallic deposit (sericite $^{40}\text{Ar}/^{39}\text{Ar}$ plateau age of 138 Ma), and Hongling Pb-Zn polymetallic deposit (molybdenite Re-Os isochron age of 140.3 ± 3.4 Ma), suggesting that Yanshanian magmatism played an important role in the Pb-Zn mineralization of this area. We conclude therefore that the Baiyinnuoer Pb-Zn deposit formed over two metallogenic epochs at ca. 250 Ma and ca. 142 Ma, and that the Yanshanina contributed significantly to the lead-zinc mineralization at the deposit