Multi-stage Mineralization at Huangshaping W-Mo-Cu-Pb-Zn Polymetallic Deposit, Southeastern China: Constraints from Fluid Inclusions, Trace Elements, and Isotopes

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The Huangshaping polymetallic deposit is located in Hunan Province, southeastern China. It is a world-class W–Mo–Pb–Zn–Cu skarn deposit in the Nanling Range Metallogenic Belt.Three types of fluid inclusions have been identified in the ores of the Huangshaping deposit. The high-temperature and high-salinity immiscible magmatic fluid is responsible for the W–Mo mineralization, whereas low-temperature and low-salinity magmatic-meteoric mixed fluid is responsible for the subsequent Pb–Zn mineralization. Another magmatic fluid derived from deep-rooted magma is responsible for Cu mineralization. Rare earth element patterns and trace element features of calcites from W–Mo, Pb–Zn, and Cu ores are quite different, indicating that different sources of fluids were involved in the W–Mo, Pb–Zn, and Cu mineralization, respectively.

Sulfur isotopes shows a magmatic sulfur source with a contribution of reduced sulfate sulfur host in the Carboniferous limestone/dolomite and more magmatic sulfur involved in the Cu mineralization than that in W–Mo and Pb–Zn mineralization. The lead isotopic data suggesting Pb^{206-}, U^{238-}, and Th^{232-} rich material are involved in the mineralization. It is concluded that granite porphyry magmas might responsible for the W–Mo and Pb–Zn mineralization during which its fluid evolved from magmatic immiscible to a magmatic–meteoritic mixing, and the other derived from deep-rooted magma is related to Cu-related mineralization.