



Geochemical Evidences of Supernormal Enrichment for Zn-Pb-(Ge-Ag) Deposits in the Sichuan—Yunnan—Guizhou Triangle (SYGT) Area, China

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Abstract: The well-known Sichuan—Yunnan—Guizhou Triangle (SYGT) area, southwest China of poly-metallic Zn-Pb deposits is located at the south-western margin of the Yangtze Block in the transition area of the Tethys Belt and the Circum-Pacific Metallogenic Belt. More than 500 Zn-Pb deposits and ore occurrences are distributed in this area. There are many high-grade (Pb+Zn:15%~35%) Zn-Pb-(Ge-Ag) deposits, e.g. Huize, Maoping, Zhugongtang super-large-scale deposits and Maozu, Lehong, Fulechang, Tianbaoshan and Daliangzisuper-scaledeposits. In these deposits, the Huize deposit is one of the richest super-large-sized Zn-Pb deposits in the world. Han et al. (2007, 2015, 2017) have summarized the unique characteristics of deposits in SYGT which are different from typical Mississippi Valley-type (MVT), discussed the metallogenic regularities, andproposedthe genesis model of HZT-type Zn-Pb deposit newly.In this paper, the geochemical evidences of supernormal enrichment for Zn-Pb-(Ge-Ag) deposits have briefly summarized.

Theoretical basis: Computer simulation shows large amounts of Zn and Pb metals can be migrated by chlorine complex. Phase diagrams indicate the lower pH, the greater solubility, the greater ability to transport metals.

Micro-geochemical evidences: The temperature measurement of fluid inclusion and isotopic compositions reveal that there are two kinds of fluids involved in mineralization. They aredeep source fluid with medium to high temperature and low salinity and basin fluid of low temperature and high salinity from the Mesozoic sedimentary basin (Zhang et al., 2017). These evidences include pH value in hydrothermal system, adequate ore sources, boiling effect and mixingeffect of fluid, and strong tectonic driving forcewhich is closely related to the Indosinian collision orogenic event.

Experimental evidences: Hydrolysis experiment indicates that $\text{pH} < 4$ is a favorable condition for transporting a large number of metals. Precipitation experiment shows that the increase of pH can obviously promote the precipitation of Zn-Pb sulfide, boiling effect results the formation of some high grade ores, and mixing effect can produce precipitation and mineralization.

Mechanisms of supernormal enrichment: Combined with the ore-forming conditions and the HZT-type metallogenic theory (Han et al., 2014), rich Zn-Pb deposits formed in those

conditions which are favorable metallogenic tectonic setting, abundant mineral resources and fluid, strong driving force of strike-slip fault-fold structure, superior storage space, strong decompression boiling and mixing and ‘injection’ and replacement of mixingfluid.

Key words: supernormal enrichment, geochemical evidences, Zn -Pb-(Ge-Ag) deposits, the Sichuan—Yunnan—Guizhou Triangle (SYGT) Area

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