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

HAN Runsheng* and ZHANG Yan

Kunming University of Science and Technology; Southwest Institute of Geological Survey, Geological Survey Center for Non-ferrous Mineral Resources, Yunnan, Kunming 650093, China.


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 Daliangzi super-scale deposits. 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, and proposed the 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 chloride 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 are deep fluid 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 mixing effect of fluid, and strong tectonic driving force which is closely related to the Indo-Burma collision orogenic event.

Experimental evidences: Hydrolysis experiment indicates that 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 mixing fluid.

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

Acknowledgment: This work is granted by the Funds for the NNSF program (No. 41572060, U1133602), Projects of YM Lab and Innovation Team of Yunnan province (2011, 2012).

References

About the first author
HAN Runsheng, male, born in 1964 in Xianyang City, Shaanxi Province; Ph. D; graduated from Kunming University of Science and Technology; professor of Kunming University of Science and Technology. He is now interested in the study on Metallogenic Dynamics and Location Prediction of Hidden Ores. Email: 554670042@qq.com; phone: 0871-65180377, 13987166018.

* Corresponding author. E-mail: 554670042@qq.com

© 2019 Geological Society of China