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Metallogenic Regularities and Deposit Type of Rich (Ge-Ag)-Zn-Pb Deposits in the Sichuan－Yunnan－Guizhou Triangle (SYGT) Area, China

HAN RunSheng[1*], WANG Feng[2], ZHANG Yan[1], ZHOU Gaoming[3] and HE Jiaojiao[1]

1 *Kunming University of Science and Technology; Southwest Institute of Geological Survey, Geological Survey Center for Non-ferrous Mineral Resources, Yunnan, Kunming 650093, P.R.C.*
2 *Yunnan Metallurgical Group Co., LTD, Kunming, Yunnan650000, P.R.C.*
3 *Yunnan Chihong Zn &Pb Co. Ltd., Qujing, Yunnan 655011, P. R. C.*

1 Introduction

The well-known Sichuan － Yunnan － Guizhou Triangle (SYGT) area of poly-metallic Zn-Pb deposits, southwest China 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, and is composed of the Northeastern Yunnan, Northwestern Guizhou and Southwestern Shichuan Deposit Concentration Districts. More than 450 Zn-Pb deposits and ore occurrences are spread in the delta area enclosed by the NS-trending Xiaojiang fault belt, the NW-trending Kangding–Shuicheng fault belt and NE-trending Mile–Shizong fault belt. There are many large-scale to super-large-sized high-grade rich (Ge-Ag)-Zn-Pb deposits in the world. E.g. Huize, Maoping, Lemachang, Maozu, Lehong, Jinshachang, Fulechang, Tianbaoshan, Xiaoshifang deposits, etc. In these deposits, the Huize deposit is one of the richest Zn-Pb deposits in the world. SYGT is great potential area to find rich and large deposits, and becomes the most frontier hotspots in geoscience research. It is the largest Zn-Pb industry base in China, and has been listed as one of the 16 major exploration areas of national resource planning.

On the basis of summarizing the unique characteristics of deposits in SYGT (Han et al., 2007, 2012), the metallogenic regularities of deposits have briefly summarized, and the new deposit type has been proposed.

2 Metallogenic Regularities of Deposits

1.1 Spatial Distribution Regularities

Based on a large number of routes mapping, seismic section exploration and ore-field structure research, the spatial distribution of deposits is controlled by thrust-fold structure, and the hierarchical ore-controlling system of thrust fold structures is put forward: The thrust fold structure group controlled deposit concentration districts; Thrust fold structure zones controlled Zn-Pb ore-fields; Thrust-fold structures controlled Zn-Pb deposits, and secondary compressive-shear faults controlled ore-bodies or ore-veins.

1.2 Metallogenic Chronology

For more than ten years, the metallogenic epoch of Zn–Pb deposits in the SYGT area has been one of the main hot research topics. In order to understand tectonic and geodynamic setting in the SYGT area, it is necessary to provide the accurate chronology constrains of metallogenic epoch which has be illuminated from the chronology constrains of the multiple methods, such as the geological inference, the screening of systematic measurement of ancient structural stress and the chronology constrains of isotope dating. It is proposed that major ore-forming epoch was the late indosinian (200 ~ 230 Ma) (Han et al., 2014), which was coincident with the main formation epoch of the thrust-fold structure zones.

1.3 Ore-Controlling Regularities of Thrust Fold Structures

1) Ore bodies are controlled by thrust-fold structure and transforming surfaces of hydrothermal alteration, and formed typical mineralizing structure.

2) Ore-controlling types are sinistral-type Lambda-type. Ore-controlling structural plans are thrust-fold structure and the interface of alteration lithofacies.

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

3) Ore-forming tectonic system is NE-trending tectonic zone.

4) Thrust fold structures controlled 3D location, these are, ore bodies are distributed in equal distance and depth, and ore bodies are left actively distributed in the plane, and ore bodies have inclined in SW-trending in the profile.

5) Thrust-fold structures is the ore-transmitting structures of deposits, and secondary tensional-shear faults with oblique thrust faults and folds are the ore-distribution structures of deposits, and secondary compressional-shear faults are ore-containing structures of deposits.

1.4 Ore-Forming Processes

The deposits in SYGT experienced three stages: 1) The formation of thrust-fold structures and extensive fluid flow; 2) Fluid 'injecting' into fault zones and the differentiation of gas–liquid; 3) Unloading of ore-forming fluid and coupling mineralization of ore-controlling structures and metallogenic fluid.

2. Deposit type

By contrast, the characteristics of Zn–Pb deposits in the SYGT are obviously different from those of MVT-type deposits in the tectonic setting, main controlling factors, typical features of the deposits, mineralization horizon, metallogenic geological bodies, ore structure, ore-forming structural system, physical-chemical conditions, geological processes and metallogenic model, etc. The Huize-type (HZT) lead-zinc deposit has be put forward.

HZT-type deposit means carbonate-hosted deposits are controlled by thrust-fold structures, which 'injected' to mineralize by the ore-forming fluid of medium-high temperature and low salinity with rich vapor or CO2 under the compressive tectonic setting. Therefore, the carbonate-hosted epigenetic hydrothermal-type Zn-Pb deposits of irrelevant magmatic origin may be divided into MVT-type deposits (e.g. Huayuan style and Dongmozhua style, etc.), HZT-type deposits and Transitional-type deposits (Fankou style, etc.).

Conclusion

Combined with the unique characteristics of deposits in SYGT, the ore-forming regularities are tectonic hierarchical ore-controlling system, the association of mineralization and alteration facies, typical mineralizing structure, the zoning of mineral combination and alteration and metallogenic geochemical barrier. Zn-Pb deposits in SYGT belong to the HZT-type deposits which are different from those of typical MVT-type deposits.

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