

Division of Metallogenic Provinces for Pb-Zn Ores in Guizhou Province

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Abstract. After a comprehensive analysis of previous studies, information of Pb-Zn ores in Guizhou Province, including their hosting features, Petro mineralogic features, metallogenic epochs, provenance and metallogenic mechanisms, is understood. Based on such information, areas of Pb-Zn ores in Guizhou Province are classified into 4 metallogenic provinces, namely western, southeastern, northeastern and northern Guizhou Province. North-western and southeastern Guizhou Province is crucial metallogenic provinces of Pb-Zn ores in Guizhou Province. At present, north-western Guizhou Province has't exhibited great potential for prospecting.

Keywords: Lead-zinc Ores, Distribution Laws, Western Guizhou Province.

1. Introduction

In western Guizhou Province, there is a considerable amount of Pb-Zn ores, which have been examined by many experts and scholars (Zhang,2005; Jin, 2006; Nie et al., 2007,2014; Li et al.,2012; Wang et al.,2013) and great achievements have been made in their research. Hosting features, petromineralogic features, mineragenetic epochs, provenances and metallogenic mechanism of Pb-Zn ores in Guizhou Province are understood to analyze geological features and distribution laws of these ores. Besides, metallogenic provinces of these ores are classified to provide basic data for scientific research and exploration of the ores.

2. Geological Backgrounds of Metallogenesis

Sichuan and Yunnan are the most potential provinces for prospecting super-large Pb-Zn ores and gold deposits in China (Tu et al.2000).In the west of Guizhou Province, the metallogenic province of Pb-Zn ores is on the southwestern margin of Yangtze Para platform and in the east of Xikang Yunnan axis as a upper Yangtze metallogenic subprovince in the metallogenic province of Yangtze paraplatform, which is an integral part of polymetallogenic ore clusters in Sichuan, Yunnan and Guizhou provinces (Jin, 2006).Listed from the old to new, exposed strata include Sinian Dengying Formation, Cambrian system, silurian, Devonian system, carbonic system, Permian system, Triassic system, Jurassic system, tertiary system and quaternary system, among which Permian Emeishan basalts are extensively distributed across the whole area. This zone has tectonically evolved through Chengjiang orogeny, Caledonian orogeny, Hercynian orogeny, Indosinian orogeny, Yanshanian orogeny and Himalayan orogeny.



3. An Overview of Resources in Pb-Zn Ores in Guizhou Province

Guizhou Province is rich in Pb-Zn ores, which are mainly distributed in northwestern and southeastern Guizhou Province, including Weining County, Hezhang County, Shuicheng County, Pu'an County, Zhijin County, Duyun County, Kaili County, Taijiang County, Zhenyuan County, Sandu County and Dushan County.

4. Division of Metallogenic Provinces

According to geological features of mineral deposits, Pb-Zn ores are generally distributed in two metallogenic provinces, namely western Guizhou Province (including southwestern, western and northwestern Guizhou Province) and eastern Guizhou Province (including southeastern and northwestern Guizhou Province).

In northwestern Guizhou Province, the metallogenic provinces mainly include Liupanshui, Puding, Nayong, Weining and Hezhang. Northwestern Guizhou Province possesses far more resources than southwestern Guizhou Province as an important metallogenic province for Pb-Zn ores in Guizhou Province. In this area, the exposed strata are sinian-jurassic. Emeishan Basalt is widely distributed in this area. On ore-bearing strata of Pb-Zn ores, there are middle and upper devonian and carbonic carbonate rocks (Guizhou province geology and mineral bureau, 2014). On these strata, carbonic carbonate rocks are major host rocks (Jin, 2006). This area is being well developed with extensive faults, creating conditions for the formation of Pb-Zn ores (Wang et al., 2014). Inside this area, Pb-Zn ores are spread in the form of bands, mostly distributed in Weining, Hezhang, Liupanshui and surrounding areas of Puding County. The deposits are apparently characterized by the distribution along the NW-SE direction.

In southwestern Guizhou Province, metallogenic provinces are mainly surrounded by Panxian, Pu'an and Qinglong, in which ore-bearing strata mainly include upper Devonian series, carbonic Dapu Formation, Huanglong Formation and Maping Formation. There are ore-bearing wall rocks such as limestone, dolomite and their transitions. Ore bodies, which are stratiform-like or lenticular with generally the same mode of occurrence as upper and lower strata, are tectonically developed (Non-ferrous metals geological exploration bureau of Guizhou, 2009).

In southeastern Guizhou Province, metallogenic provinces are also major areas of Guizhou Province where Pb-Zn ores form. In this area, the exposed strata extend from the lower Sinian system to the upper Triassic system. The lower Cambrian Qingxudong Formation and the middle Cambrian Gaotai Formation are ore-bearing strata of Pb-Zn ores. Several tectonic movements have happened inside that area, where folds and fractures are fairly developed. For ore bodies, the modes of occurrence are related to ore-hosting strata. The ore bodies from carbonate rocks generally occur in the same mode as wall rocks, and the ore bodies from carbonatites almost occur in the same mode as faults.

There are much fewer deposits of Pb-Zn ores in metallogenic provinces of northeastern Guizhou Province than southeastern Guizhou Province. From southeastern Guizhou Province to northeastern Guizhou Province, the scale and quantity of Pb-Zn ores decline a lot. Nevertheless, the trend of decline is not evident no matter in scale of mineral deposits or quantity of resources from southwestern Guizhou Province to northwestern Guizhou Province. On the western border of Guizhou Province, small and medium-sized Pb-Zn deposits have been also discovered, which suggests that Pb-Zn deposits in northwestern Guizhou Province Guizhou Province, southwestern Guizhou Province, Yunnan Province and Sichuan Province are within a common metallogenic province. Lots of scholar's study Pb-Zn ores on the border of these three provinces as a whole (Wang et al., 2013), which suggests that the formation of these ores is impacted by large-scale geological processes. This coincides with the viewpoint that the formation of Pb-Zn ores is affected by the intrusion of diabase bodies (Non-ferrous metals geological exploration bureau of Guizhou, 2009).

In Xishui, Zheng'an and areas of Guizhou Province around rivers, there is a small amount of Pb-Zn deposits. In these areas, there is only a small amount of Pb-Zn resources, which are mainly small mineral deposits and mining areas.

5. Discussions

The Pb-Zn deposits of Guizhou Province are generally classified into two categories dependent upon the causes of their genesis, namely Mississippi valley-type (MVT) deposits of carbonate rocks and vein-type deposits of metamorphic rocks. Although there are multiple ways for classifying metallogenic provinces of Pb-Zn ores, this paper suggests that it is more suitable to categorize these provinces according to metallogenic mechanism. Pursuant to geological and geochemical features of deposits (Zhang et al., 1988; Qian, 2001; Zhang, 2003; Gu, 2006; Zhang et al., 2016; Wang et al., 2014), the causes of genesis would be similar, but vary significantly between southeastern and northeastern Guizhou Province. The connections are relatively weak between northern Guizhou Province and other areas. As a whole, it is better to classify Pb-Zn ores of Guizhou Province into western, southeastern, northeastern and northern metallogenic provinces.

6. Conclusion

After a comprehensive analysis, it is concluded that: 1) there are four metallogenic provinces of Pb-Zn ores in Guizhou Province, namely western, northeastern, southeastern and northern Guizhou Province. 2) Northwestern and southeastern Guizhou Province are important metallogenic provinces of Pb-Zn ores. Furthermore, there are certain reserves of Pb-Zn ores in southwestern Guizhou Province. 3) Metallogenic provinces vary in ore-bearing strata and ore-forming material sources. 4) In northern Guizhou Province, there is a small amount of Pb-Zn ores, which are mostly small deposits and mining areas. For the time being, they don't show great potential for prospecting.

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