

Distribution Characteristics of Rare, Rare Earth and Scattered Element in Southwestern Guizhou

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Abstract. Based on previous data, distribution characteristics of rare, rare earth and scattered element in southwestern Guizhou Province are comprehensively studied. The results suggest that abundant “micro grained disseminated” gold ores have great prospect for expansion in southwestern Guizhou Province, where scandium mines are accompanied by enrichment of anatase and meet the requirements for forming independent beds. In minerals such as gold and lead-zinc ores, there are several types of beneficial elements which may be comprehensively developed.

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

1. Introduction

Rare, rare earth and scattered element are characterized by rare independent mineral deposits, small amount of resources, decentralized distribution, low enrichment and difficult extraction. Rare elements include Nb, Ta, Be, Li, Zr, Sr, Hf, Rb, Cs and Au. The number of rare earth elements is deemed to be 14, 15 and 17 respectively, among which 17 rare earth elements are generally Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu. Dispersed elements refer to Ga, Ge, In, Tl, Re, Cd, Sc and Te and so on (Liu et al., 1984; Cheng et al., 1994; Tu et al., 2004; Editorial board of Mineral resources industry requirements Manual, 2014). Rare, rare earth and scattered element are fairly important strategic resources. Minerals of these rare elements are discovered in several areas of Guizhou Province and reserved in certain amount. By studying distribution characteristics of these elements in southwestern Guizhou Province based on previous data, their distribution laws are summarized, thus providing basic data for further prospecting of the elements.

2. Regional Geological Backgrounds

Lead-zinc ores, which are mostly distributed in northwestern Guizhou Province, which composes the Sichuan-Yunnan-Guizhou metallogenic belt of lead-zinc ores together with eastern Yunnan and Southern Sichuan provinces. From the perspective of its tectonic structure, western Guizhou Province lies on the rift of Youjiang River on the southwestern margin of Yangtze Plate. Sanjiang fold zone is the boundary in the west of the rift in Youjiang River, while the south of the rift adjoins the South China Block (Nie and Kang, 2014). In northwestern Guizhou Province, the metallogenic province of lead-zinc ores is on the southwestern margin of Yangtze Para platform and in the east of Xikang



Yunnan axis as a upper Yangtze metallogenic sub province in the metallogenic province of Yangtze Para platform (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. Carboniferous carbonate rocks are essential ore-bearing strata and host rocks for lead-zinc ores. This zone has tectonically evolved through Chengjiang orogeny, Caledonian orogeny, Hercynian orogeny, Indosinian orogeny, Yanshanian orogeny and Himalayan orogeny.

3. Characteristics of Gold Distribution

There are abundant gold-ore resources in Guizhou Province. In Southwestern Guizhou Province, there are mainly “red-clay” and “micrograined disseminated” resources in southwestern Guizhou Province. Micrograined disseminated resources, also known as Carlin-type gold deposits, are well known all over China. In Southwestern Guizhou Province, sedimentary strata, which develop well, are widely distributed. Micrograined disseminated strata, particularly ore-hosting strata, belong to upper Permian and lower triassic series. The strata in Youjiang River are Triassic and typical deposits include large Huijiabao gold ores. Nie(2009)reported in his research that in Southwestern Guizhou Province, disseminated gold ores may be divided into three subtypes, namely the micrograined disseminated gold ores from impure carbonates and the micrograined disseminated gold ores in pyroclastic rocks. Emeishan Basalt provides these ores with ore-forming materials. In Southwestern Guizhou Province, the spatial distribution of Carlin-type gold deposits is controlled by regional tectonic setting. The time of their genesis, development and disappearance is the same as that of Youjiang Basin (Han, 1999). Red-clay types refer to gold deposits accumulated after weathering of primary gold ores (Wang et al., 1994). There is only a small amount of lateritic gold deposits in southwestern Guizhou Province.

As a whole, southwestern Guizhou Province is rich in gold-ore resources. In metallogenic belts around Xingyi, Anlong, Zhenfeng and Xingren, there are lots of large, medium-sized and small gold deposits, which are mostly micro grained and disseminated. This indicates that gold is common in southwestern Guizhou Province, where there is potential for making breakthroughs in quantity of resources. In particular, efforts are expected to be made in prospecting gold-ore resources in this area.

4. Distribution Characteristics of Rare Earth Elements

In Guizhou, rare earth elements are mainly enriched in bauxite-bearing rock series and phosphate ores, but rarely seen in other strata or ores. However, scandium is enriched in anatase in Shazi Town, Qinglong County at 50ppm at maximum (Nie et al., 2015). Having met the requirements for developing into independent scandium deposits, it has relatively great value for prospecting and development. The enrichment of scandium is associated with anatase in karst depression on the top of Maokou limestone; scandium-containing anatase exists in quaternary vestigial laterite on the surface of unconformity in karst of Permian Maokou limestone (Nie et al.,2015). Except for scandium, no other rare earth element has been found to meet the requirements for developing into independent deposits for the time being, but mostly coexist in the form of associated elements and are not greatly enriched.

5. Distribution Characteristics of Other Elements

In southwestern Guizhou Province, there are abundant resources such as coal, gold and lead zinc ores, which are accompanied by several types of beneficial elements. Gold ores and their tectonic hydrothermal altered rocks often contain beneficial elements such as Tl, Se, Te, Cd, Re and In. In southwestern Guizhou Province, there are abundant coal resources; the content of Ca and Ge ranges from 3 to 58ug/g and 1-220ug/g in Liuzhi coal mines of Liupanshui; beneficial elements such as Se

and Te exist in antimony ores of Dachang Town, Qinglong County. In Guizhou, lead-zinc ores are generally accompanied by Ga, Ge, In, Cd and Ag in cedar forests of Shuicheng County (Guizhou province geology and mineral bureau, 1987). In Langmuchang of Xingren County, Tl deposit is the world's first independent one within a Hg-Au ore (Chen et al., 2000; Tu et al., 2004). In this area, other elements of Rare, rare earth and scattered element are not evidently enriched or develop into independent deposits, so they are still not eligible for development and utilization.

6. Conclusion

After a comprehensive analysis, it is concluded that: 1) southwestern Guizhou Province is rich in "micro grained disseminated" gold-ore resources, which host in Permian and Triassic strata, so it has potential for further expanding its reserves, and deposits of scattered elements like Tl deposits might form in gold ores of southwestern Guizhou Province; 2) For rare earth elements, Sc is enriched with anatase, meets the requirements for forming independent deposits and has great prospect for prospecting/development; 3) Coal measures, gold ores, antimony ores and lead-zinc ores are accompanied by several types of beneficial elements, which may be comprehensively considered during development and utilization.

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