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## The Geochemical Characteristics of REE of Altered Wall-rocks in Lala Copper Deposit in Sichuan Province, China

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### 1 Introduction

Lala deposit is one of the important large copper deposits in southwest of China, accompanying with a variety of Au-Mo-Co-REE-Fe for comprehensive utilization. It has the typical significance in terms of prospecting (LI Ze-qin, 2002). Lala deposit consist of Luodang mine area, Luodong mine area, Lijiacun mine area and Shilong mine area. The copper ores are mainly produced in Luodang mine are, there have found out 32 ore bodies, accounting for 97% of the whole reserves of mine areas.

### 2 Samples and Experimental Method

In this paper, the samples are taken from the open pits of Lala copper deposit, namely Luodang mine area, Luodong mine area and Shilong mine area. The REE of samples were analyzed by Key Laboratory of Chengdu University of Technology of Sichuan Province by the means of inductively coupled plasma mass spectrometry (ICP-MS). The high-precision mass spectrometer is produced by PerkinElmer company, and the relative error is less than 20%.

### 3 Results and Conclusion

The ore samples are divided into three series, namely biotite schist, garnet biotite schist and albite leptynite. The  $\sum\text{REE}$  of samples vary greatly from  $9.87 \times 10^{-6}$  to  $4336.71 \times 10^{-6}$ , the average value is  $765.74 \times 10^{-6}$ .

The variety scope of  $\sum\text{REE}$  of biotite schist is between  $755 \times 10^{-6}$  and  $2787.80 \times 10^{-6}$ , the average value is  $1462.53 \times 10^{-6}$ . The chondrite-normalized REE patterns of

biotite schist (Fig.1) incline right with positive Eu anomaly. The tendencies of the chondrite-normalized REE patterns of samples are almost the same, explaining that the source materials were similar (LI Yan-hua, 2007).

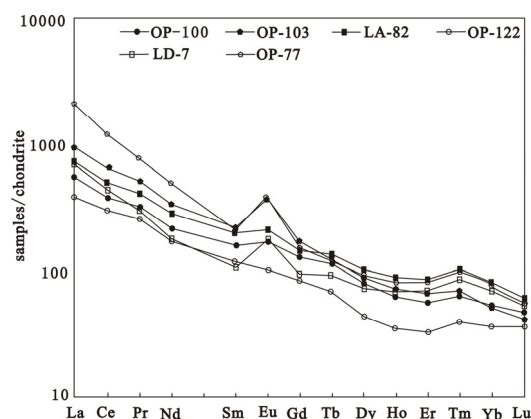


Fig. 1. the chondrite-normalized REE patterns of biotite schist.

The  $\sum\text{REE}$  of garnet biotite schist range from  $502.55 \times 10^{-6}$  to  $2470.02 \times 10^{-6}$ , the average value is  $1523.40 \times 10^{-6}$ . The chondrite-normalized REE patterns of garnet biotite schist (Fig.2) show the characteristic of LREE-enriched. All the samples except L-25 show the characteristic of positive Eu anomaly. In the early magmatism, the temperature is higher than  $250^\circ\text{C}$ , Eu is usually exist in the form of  $\text{Eu}^{2+}$  which has bigger ionic radius and less charge number than  $\text{REE}^{3+}$ , as a result of adsorption on the surface of garnet easily, thus showing the positive Eu anomaly (REN Tao, 2010). In the later hydrothermal alteration, due to the metasomatism that bring into or take out the materials, resulting in the negative Eu anomaly. Therefore, the garnet biotite schist may have two sources of ore-forming materials—

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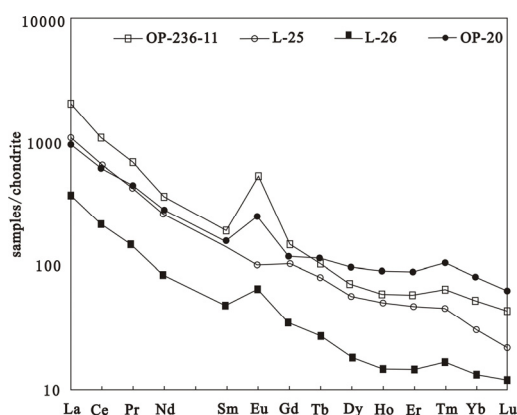


Fig. 2. the chondrite-normalized REE patterns of garnet biotite schist.

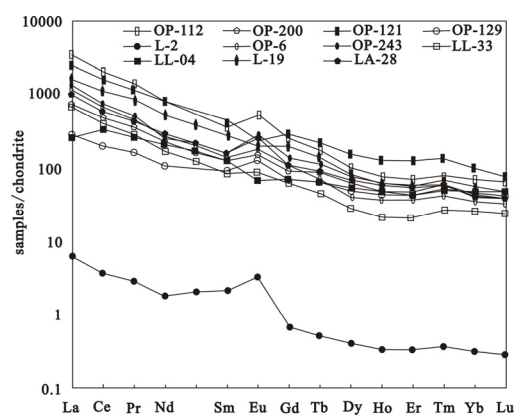


Fig. 3. the chondrite-normalized REE patterns of albite leptynite.

inheriting the early ore-forming materials in provenance and later hydrothermal alteration causing different ore-forming materials.

The  $\sum \text{REE}$  of albite leptynite range from  $9.87 \times 10^{-6}$  to  $4337.71 \times 10^{-6}$ , the average value is  $1693.85 \times 10^{-6}$ . The chondrite-normalized REE patterns of albite leptynite (Fig.3) incline right with LREE-enriched. All the samples except L-04, L-19 and OP-121 show the characteristic of positive Eu anomaly, indicating the samples may inherit the characteristic of positive Eu anomaly in provenance. By the influence of that the plagioclase cumulate added during the process of partial melting or the process of fractional crystallization, the provenance acted the characteristic of positive Eu anomaly (P-Henderson, 1989). The samples which show the characteristic of negative Eu anomaly may came from the later hydrothermal alteration. The characteristic of sources is similar with the garnet biotite schist.

In summary, the chondrite-normalized REE patterns of all the samples in this paper show the characteristic of right-leaning. Eu has two characteristics of that positive Eu anomaly and negative Eu anomaly. The samples of positive Eu anomaly have the similar origins that inherit the early ore-forming materials in provenance. And the

samples of negative Eu anomaly have the similar sources that come from the later hydrothermal alteration.

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