

# **REE, Fe and Mn elements characteristics of calcite and their prospecting significance of Banqi Carlin-type gold deposit in Guizhou, southwestern China**

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Banqi gold deposit is one of the most important parts of the southwestern Guizhou Carlin-type gold district, and is the first Carlin-type gold deposit found in China. As the major gangue mineral in this deposit, Calcite can be divided into four types based on their formation time: pre-mineralization, main metallogenic epoch, late stage of mineralization, and post-mineralization. All types of calcites where in field occurrence, physical typomorphic characteristics and trace elements characteristics are inconsistent. The pre-mineralization calcite with highest REE contents ( $\Sigma\text{REE}=29.70\text{--}40.10$  ppm), is characterized by most enriched LREE ( $\text{LREE}/\text{HREE}=1.96\text{--}3.03$ ), a distinct positive Eu anomaly ( $\delta\text{Eu}=3.83\text{--}5.02$ ) and almost no Ce anomaly ( $\delta\text{Ce}=1.02\text{--}1.05$ ); The calcite of main metallogenic epoch with relatively low REE contents ( $\Sigma\text{REE}=10.76\text{--}15.53$  ppm), is characterized by most enriched HREE ( $\text{LREE}/\text{HREE}=0.11\text{--}0.23$ ), almost no Eu ( $\delta\text{Eu}=0.73\text{--}1.20$ ) and Ce anomaly ( $\delta\text{Ce}=0.88\text{--}1.25$ ); The calcite of late stage of mineralization with lowest REE contents ( $\Sigma\text{REE}=2.82\text{--}4.34$  ppm), is characterized by enriched HREE ( $\text{LREE}/\text{HREE}=0.26\text{--}0.86$ ) which is similar to the calcite of main metallogenic epoch, while with weakly negative Eu ( $\delta\text{Eu}=0.67\text{--}0.83$ ) and Ce anomaly ( $\delta\text{Ce}=0.55\text{--}0.81$ ); Post-mineralization calcite with relatively low REE contents ( $\Sigma\text{REE}=6.92\text{--}10.91$  ppm), is characterized by enriched LREE ( $\text{LREE}/\text{HREE}=1.83\text{--}2.34$ ), weakly negative Eu anomaly ( $\delta\text{Eu}=0.72\text{--}0.74$ ) and moderately negative Ce anomaly ( $\delta\text{Ce}=0.41\text{--}0.50$ ). In addition, the Fe and Mn contents of ore-forming stage calcites are obviously higher than that of the calcites unrelated to mineralization. And negative correlation existed between Fe+Mn contents and LREE/HREE ratio of those calcites. It illustrates that the dominant factor for the calcites enriched in HREE are caused by the internal Fe and Mn materials. It will provide an important exploration method for Dian-Qian-Gui Carlin-type gold deposits, through the study of typomorphic characteristics of calcite.