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Geochemical Characteristics of Trace Element of Calcite，Quartz of the No. 510-1 Uranium Ore Deposit in Zoige

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The uranium ore field in Zoige, Sichuan province, is one of the famous carbonaceous-siliceous-argillitic rock uranium deposit producing districts in China, The No.510-1 uranium deposit is one of the typical desposits that have representative significance in this district, ore mineral assemblages of the deposit often forms the combination of pitchblende, pyrite, calcite, quartz, which reflects that hydrothermal minerals such as calcite, quartz and pyrite are closely related with uranium mineralization(Chen Youliang et al., 2012). The characteristics of trace elements geochemical of hydrothermal minerals such as calcite, quartz and pyrite in this uranium deposit are studied in order to provide important information for the sources and evolution of ore-forming fluid in this dissertation.

1 Samples and Experimental Methods

Samples of this experiment are collected in open pit and 2-7 middle orebodys in the No.510-1 uranium ore deposit, there are a total of 18 calcite samples and 4 quartz samples in metallogenic period. The samples collected are crushed and pure single mineral is picked out from them under the microscope, then the single mineral picked out from samples is ground to 200 mesh powder in an agate mortar. The testing of samples was carried out at Analytical Laboratory of Beijing Research Institute of Uranium Geology. Trace element were analyzed by DZ/T00223-2001 Inductively coupled plasma mass spectrometry (ICP-MS) method, and the instrument model is HR-ICP-MS Element I made by Finnigan company , the relative error ≤ 10%.

2 The Trace Elements Geochemical Characteristics

Analysis results show that calcite Samples crystallized at the main mineralization stage significantly enrich Zn (538.31×10^{-6}), Cd (3.71×10^{-6}), Ni (63.70×10^{-6}), V (127.81×10^{-6}), W (1.52×10^{-6}), Co (2.21×10^{-6})，compared with carbonate rocks in eastern China, and Ni and Co among them are deep-source element, which reflects hydrotherm of calcite vein formed from the ore-forming processes would originate from deep-source. Trace elements concentrations of quartzs formed at the main mineralization stage generally are lower than that of calcites, and quartzs have higher concentrations of Zn (127.60×10^{-6}), Cu (53.55×10^{-6}), Ni (46.95×10^{-6}), V (13.03×10^{-6}), Ba (12.99×10^{-6}), Sb (5.22×10^{-6}), W (4.19×10^{-6}). It can be seen that calcite and quartz crystallized at the main mineralization stage have the similar characteristics of trace elements compositions, implicating that both geological fluid forming them may have homology.

3 REE Geochemical Characteristics

The experiments show that calcites and quartzs crystallized at the main mineralization stage overall have lower concentrations of rare earth element but wider range of variation. The contents of REE in calcites are generally higher than that in quartzs. The ΣREE of Calcites range from 0.634×10^{-6} to 50.411×10^{-6} (average 29.242×10^{-6}), the ratios of LREE/HREE is between 0.123 and 1.764 (average 0.424), the ratio of $(La/Yb)_N$ ranges from 0.168 to 5.533 (average 1.252), which shows that calcites have no distinct fractionation between LREE and HREE. From Fig. 1, REE distribution patterns as a whole are relatively flat type (chondrite-normalized REE data recommended from Sun et al., 1989), the ratio of $(La/Sm)_N$ ranges from 0.185 to 3.048, the ratio of $(Gd/Yb)_N$ ranges from 0.755 to 1.340, suggesting that LREE and HREE have no distinct fractionation in interior. Eu is characterized by weak negative anomaly or no anomaly with δEu varing from 0.677 to 1.056 (average 0.789).

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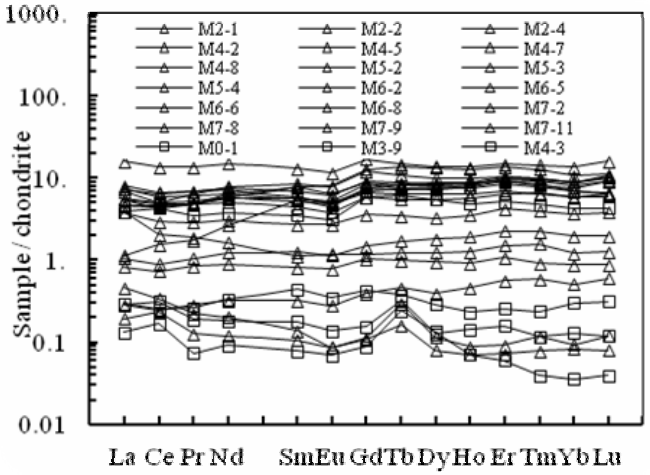

Fig. 1. Chondrite-normalized REE distribution patterns of calcites and quartzs formed at the main mineralization stage

note and are on behalf of calcites and quartzs samples formed at the main mineralization stage

The ΣREE of quartzs formed at the main mineralization stage range from 0.421×10^{-6} to 23.219×10^{-6} (average 6.454×10^{-6}), the ratios of LREE/HREE is between 0.376 to 0.896 (average 0.667). the ratio of $(La/Yb)_N$ ranges from 0.895 to 3.706 (average 1.947), which indicates that quartzs have no obvious fractionation between LREE and HREE as well. from Fig. 1, REE distribution patterns as a whole are also relatively flat type. the ratio of $(La/Sm)_N$ ranges from 0.815 to 3.176, the ratio of $(Gd/Yb)_N$ ranges from 0.138 to 14.838, indicating that the LREE and HREE too have no significant distribution in interior. Eu is characterized by weak negative anomaly with δEu value varing from 0.669 to 0.831 (average 0.784).

4 Conclusions

In summary, calcites and quartzs crystallized at the main mineralization stage have similarity in the characteristics of trace elements composition and rare earth elements parameters, which indicates that source of ore-forming fluid forming calcite and quartz has homology. Trace elements Ni and Co are deep-source element, REE distribution patterns of calcites and quartzs all show relatively flat type(Similar To REE distribution patterns of chondrite), and both the characteristics reflect that ore-forming fluids were possibly derived from deep-source.

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