Paper Number: 1597

Trace Element Geochemistry of a Sandstone-type Uranium Deposit in the Xixi Area, Bayintala Sag

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The Bayintala sag is a secondary tectonic unit belonging to the southern margin of the Tengger depression in the Erlian faulted basin group, in Inner Mongolia[1]. The Xixi sandstone-type uranium deposit is located in the southeast of the Bayintala sag with its mineralization hosted in the fan-delta sands of the Tengger formation (K_1bt) of the Bayanhua Group (Upper Cretaceous). Based on geophysical logging data, we chose 15 ore samples (349.24～353.23 m in the ZK159-144 borehole) for trace element (44) analyses in the Analytical Laboratory of BRIUG (Beijing Research Institue of Uranium Geology). The results are as follows: (1) Mo, Cd, Sb, Tl, U are enriched in the uranium ore, and the average enrichment coefficient of U can reach 120; trace elements such as Li, Be, Ga, Rb, Nb, Cs, Ba, Ta, W, Bi, Th, Zr, Hf are relatively enriched, transition elements like Sc, V, Cr, Co, Ni, Cu, Zn are relatively depleted, and U is poorly correlated with other trace elements; (2) the chondrite- normalized REE profiles display distinct flattening towards the HREE, a negative Eu anomaly with δEu from 0.35 to 0.67, a δCe of 1.02-1.25, Ce_{anom} of -0.09-0.01, a ω(LREE/HREE) of 8.36～12.26 and $(La/Yb)_N$ of 7.69-12.52; (3) the element ratios[2,3] (V/(V+Ni) 0.73-0.86, U/Th 0.95-16.23, δU 1.48-1.96, δCe , δEu and Ce_{anom}, indicate that the uranium mineralization was deposited in an anoxic reducing environment; (4) the chondrite-normalized REE patterns and La/Yb-ΣREE relationship show that the sediment source was mainly granite; (5) the trace element distribution indicates that uranium migrated as $[UO_3(CO_3)_3]^{4-}$ and $[REE(CO_3)_3]^{3-}$, and then was adsorbed by clay and organic matter. As a result, uranium enrichment accompanied LREE/HREE fractionation and a negative Eu anomaly developed. Thus, the REE and trace element distribution provide important insights into the sedimentary environment, the nature of the metal source and the mechanism of uranium transport and deposition in forming a sandstone-type uranium deposit.

References:

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