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The distribution of uranium and REE elements in soil and sandstone of Barun Uranium Deposit in Erlian Basin, Inner Mongolia

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The Barun uranium deposit (BUD), located in Erlian Basin, Inner Mongolia, is an ancient valley-type uranium deposit, about 5 km away from Bayanwula uranium deposit, with an average grade of 0.0137% uranium. In order to study the distribution of uranium and other elements in rock and soil, the contents and distribution of stable elements and uranium, thorium and potassium, determined by in-situ gamma-ray spectrometry and ICP-MS, in samples of three soil profiles and two borehole core were systematically studied in BUD. The contents of La, Ce, Pr and other rare earth elements (REE) and the chondrite-normalized values are shown in Figure 1. As can be seen from Figure 1, the REE patterns of the overlying strata (E_2y) and the ore-bearing strata (K_1s^2) of BUD are similar, and the content of LREE in the ore-bearing strata is slightly higher than that in the non-ore-bearing strata. The REE patters of BUD, the Bayanwura and Hadatu uranium deposits in Erlian Basin are similar. Therefore, the sediments of BUD and Bayanwula uranium deposit are of the same origin. There is deficit of europium element in the REE mode of the Dongsheng uranium deposit (Figure 1). It is worth noting that the REE model of the Manglai uranium deposit located about 30 km west of BUD is similar, but the contents of both LREE and HREE are obviously lower than the average value of other uranium deposits. Vertically, the distribution of uranium rocks is mainly related to lithology and rock grain size. The uranium content in mudstone of the same stratum is higher than that in sandstone (Table 1), and the uranium content is much higher than thorium, indicating that uranium has obvious later enrichment characteristics. Based on the measured data by in-situ gamma-ray spectrometry, uranium and thorium contents in surface soil are normally distributed, but lower than the average value of uranium and thorium in Chinese sedimentary rocks, and the contents of uranium and thorium are the highest in fine-grained components in soil.

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Table 1 Uranium, Thorium and REE in the core samples in Barun uranium deposit

Code	lithology	Deep/m	U	Th	∑REE	LREE	HREE	LREE/HREE
1	Yellow sand	1.65	0.51	2.61	84.24	77.55	6.69	11.60
3	Brown-red mudstone	55.13	2.07	19.70	195.45	185.42	10.03	18.50
4	Gray-green fine grain sandstone	66.37	2.87	16.40	274.87	257.31	17.57	14.65
5	Black mudstone	76.12	71.0	10.80	266.75	251.21	15.54	16.16
6	Yellow-green coarse sandstone	83.11	3.14	7.01	275.59	265.65	9.94	26.72
7	Gray-green siltstone	85.58	210	13.80	323.96	301.08	22.88	13.16
8	Gray gravel-bearing loose fine grain sandstone	91.05	103	13.70	298.59	286.29	12.30	23.28
9	Gray gravel-bearing loose fine grain sandstone	93.89	152	14.90	342.70	326.34	16.36	19.94
10	Gray-black sandy mudstone	96.99	719	16.20	368.38	344.09	24.29	14.16
11	Gray loose coarse sandstone	98.13	104	4.99	289.85	281.45	8.40	33.50
12	Gray-black siltstone	101.07	52.4	10.60	324.83	310.33	14.50	21.40
13	Gray loose coarse fine grain sandstone	106.87	147	5.48	295.85	287.38	8.47	33.92
14	Gray loose gravelly coarse sandstone	108.79	181	10.10	398.17	377.84	20.33	18.58
15	Black-gray loose coarse sandstone	110.77	93.2	7.88	351.71	338.87	12.84	26.40
16	Black mudstone	114.32	30.6	9.17	295.77	287.63	8.14	35.33

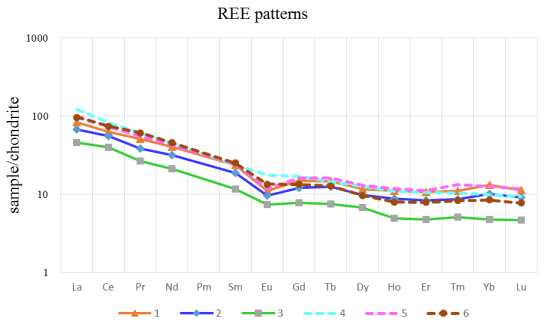

Fig.1 REE patterns of ore and surrounding rock in sandstone uranium deposits in inner Menglia

1. ore of Barun uranium deposite; 2. surounding rock of Barun uranium deposite; 3. ore of Manglai deposit; 4. ore of Dongsheng deposit; 5. ore of Hadatu deposite; 5. ore of Bayanwula deposit