Occurrence mode of valuable elements in the Permo-carboniferous coal of the Ordos Basin

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It has been proved that coal contains also some valuable metal elements which can be used as promising source of critical elements. High concentrations of Al, Li, Ga, REY, U and Ba in the Ordos Basin have been reported separately by different authors. The purpose of this review paper is to summary their accumulation mechanisms and set up an occurrence mode of these elements in entire Ordos Basin. The Al and rare elements show different patterns of distribution and affinity relationships with organic and inorganic matter. The strong peraluminous granites and moyite from the Yinshan Oldland and Lüliang Peninsula may be the main source of the Al and rare elements in the coals. The carriers of barium are witherite and strontianite, both of which are of epigenetic origin. It is inferred that the barium was originated from the Ba-ore deposits in the black shales in the Qinling Mountains, located to the south of the Ordos Basin. Uranium deposits occur near the margin of the basin and are mainly hosted in sandstones of the Jurassic.

A three-stage occurrence mode for metal element accumulations was proposed: Concentrations of the elements were controlled by geological evolution and can be divided into three stages: First stage, the Yinshan Oldland and Lüliang Peninsula uplifted in the Permian, Al, Ga, Li, and REY were moved into peat moors as forms of solid materials or complex; Second stage, the Qinling Mountains uplifted in the Mesozoic and barium was moved into Huanglong Coalfield; Third stage, Ordos Basin uplifted and faults were formed around basin margin, and fluids carried uranium into redox boundary closed the coal seams after the Mesozoic. Finally, uranium was deposited because variation of chemical conditions.

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