Geochemical study of Uranium-enriched tuff in Ordos Basin: The geological significance

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The ore-forming condition in sandstone-type uranium deposits in Ordos basin, northern China and their geochemical characteristics have been studied previously by our group ([1, 2]) in Ordos basin. Recently, the U-enriched tuff was founded which is in the Yangchang Group (upper Triassic) as local sedimentary marked layers occurred in a thin or fine-thin layers (60 cm to several mm depth in scale). This study reports the geochemical characteristics of the tuff in Ordos basin.

More than 30 samples were analyzed with major elements, trace elements and REE. The results show that some of samples have relative high U abundances (144ppm) with a large rages between 3.12~144 ppm. The total REE amount ranges from 48.57 to 402.12 ppm, and the normalized REE distribution patterns show characteristics of light REE enrichment and high REE depletion. The calculated abnormity of Eu is between 0.34~0.82 and the abnormity of Ce between 0.80~2.08. The characteristic of some trace elements show positive abnormity on Ba, U, Th, Hf, Ce and minus abnormity on Nb, P, Ti and Rb. Our results also show strong correlation between U and the related elements such as Ta, Dy and Lu. In addition, Th abundance is correlated with ΣREE. This study presents a clue that the tuff is one of sources for the enrichment of uranium metals in Ordos basin.

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Delineating exposure histories of exposed rocks using nuclear physics

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Since the development of quantitative geomorphology using cosmic ray produced isotopes [1], significant strides have been made making the method more robust, imposing constraints on past exposure geometries and histories of rock horizons [2]. The impetus provided by the international project "CRONUS", aimed at precise determination of nuclide production rates, has led to renewed efforts to make innovative approaches to robustly constrain rock exposure histories.

We discuss several approaches which should allow one to determine possible exposure histories of rocks, modeling natural processes such as: (a). Exfoliation from the top layer, (b). Deposition of a layer of soil on the exposed surface, and (c). Bioturbation in beach ridge and terrace deposits. Furthermore, an inter-comparison of erosion histories based on depth variations in cosmogenic nuclides near surface and at depths of > 1000 gm. cm^{-2} provides an excellent method to check on the exposure history model since the radiation composition is very different in the two cases. We also show how multiple measurements of a cosmogenic nuclide at different locations and of 2 or more cosmogenic nuclides can be used to check on the mean and deviant (anomalous) exposure histories. These ideas expand including use of new radionuclides expand some ideas developed earlier [1, 2].

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