

ROLE OF RARE EARTH ELEMENTS AS PROVENANCE INDICATOR IN COAL SEAMS: A CASE STUDY FROM IB-RIVER COALFIELD, ORISSA

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ABSTRACT

Abundance of rare-earth elements in the ash fractions of two coal seams viz., Lajkuria and Rampur belonging to Barakar Formation of Ib-river Coalfield in Orissa have been studied. While Lajkuria seam was studied for REE distribution in space and time on the basis of 18 subsurface samples collected from three depth zones viz., 0 - 30 m, 90 - 170 m and 280 - 305 m and from three wide-apart boreholes, REE-abundances of Rampur seam was utilised to compare with those of Lajkuria seam intersected in the same borehole.

It is observed that, in general, the ash content at different levels of Lajkuria seam progressively increases with depth without any significant relationship to REE abundances. Significant features noted from both the Lajkuria and Rampur seams are the U-shaped LREE-pattern coupled with mixed type Sm- and Eu-anomalies (+ve, zero and -ve) and depleted HREE pattern. These REE signatures imply that the inorganic components in the ash were derived from a bimodal provenance comprising primary basement of garnet-zircon-depleted but clinopyroxene-amphibole-enriched gneiss and secondary provenance of feldspathic to non-feldspathic shale. Ce-depletion is attributed to marine incursions in an overall continental environment. Maximum extent of recycling and disintegration of continental shale during the geological period from Archaean to Permo-Carboniferous is reflected in wide fluctuation of REE abundances (0.4 - 20 times NASC) of Lajkuria seam.