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Research Article

Characterization of rare earth elements by XRT sorting products of a South African coal seam

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ABSTRACT

South Africa is an important participant in the global coal market. The four Upper coal seam situated in Springs-Witbank Coalfield was subjected to XRT sorting and subsequent mineralogical studies to characterize REE content. The average total REE content (LREE and HREE) of the coal were 280 ppm on ash basis. The surrounding elemental composition besides carbon primarily consisted of O, Si, S and Fe with minor quantities of Al, P and Ti. Major minerals, such as quartz, dolomite, illite, gypsum, siderite, pyrite correlated positively with ash content ($r > 0.9$) except kaolinite, and microcline, indicating incongruent source and formation mechanisms. Additionally, the HREEs Lu, Tm, Dy, Ho, Gd and Tb displayed strong correlations ($r > 0.95$) with ash content but were negatively associated with fixed carbon. Sc is negatively associated with coal ash. Fixed carbon is weakly associated with La but negatively associated with

HREEs. La showed a weak association with Ce. Y is strongly correlated with HREE elements especially with Dy, Tm, Lu and Ho while at the same time LREE are strongly associated with Ce, Pr, Nd, La, Eu but negatively with Sc and fixed carbon levels.

KEYWORDS:

Coal REE XRT sorting South Africa

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