

## **Rare earth elements in Eastern Kentucky coals: Clues for multiple modes of emplacement**

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Rare earth elements and yttrium (REY) in coal deposits have attracted much attention in recent years because of their potential economic significance. Several eastern Kentucky Pennsylvanian coals were examined for their REY total concentration and the possible mechanisms for emplacement of the REY. Based on previous studies (e.g., Seredin and Dai, 2012), four possible modes are considered: terrigenous, tuffaceous, infiltrational, and hydrothermal, with the Fire Clay coal considered to be a typical example of the tuffaceous mode. The Fire Clay coal owes much of its high REY content to REY-bearing zircon and phosphates in a volcanic-ash-fall tonstein within the coal in many locations. However, some of the original REY elements may have been components of the detrital minerals deposited in the peat. Leaching of REY from the tonstein into the surrounding coal and the hydrothermal overprint of mineralizing fluids associated with the northwestwardly movement of the Pine Mountain thrust sheet contributed to the total REY signature in the Fire Clay coal. Not all coals are going to have the complex history of the Fire Clay coal, but it should be considered that the total history of REY emplacement by multiple mechanisms contributes to both the total REY concentration and the relative distribution of the individual lanthanide elements.

Seredin, V.V., Dai, S., 2012. Coal deposits as potential alternative sources for lanthanides and yttrium. *Int. J. Coal Geol.* 94, 67–93.