

Occurrence of carbon nanotubes and implication for the siting of elements in selected anthracites

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Abstract

Petrographic, geochemical, and electron microbeam investigations of selected anthracites and anthracite-rank coaly shales were conducted. The Pennsylvania, Rhode Island, and KwaZu-Natal anthracites show an enrichment in the middle to heavy rare earths (REE) while the Virginia semi-anthracite exhibited a decreasing trend through the light REE, a peak in Gd, and a depletion in the heavy REE. Substitution of As, Hg, and Se in pyrite was most apparent in the Virginia coal. The Pennsylvania, Rhode Island, and KwaZu-Natal anthracites contained spherical carbon nanotube (CNT) structures. The CNTs contained several elements, including Hg, Cd, F, Cl, and Br. While CNTs are known to be produced from coals of varying ranks, this seems to be the first report of naturally occurring CNTs.

Keywords

Rare earth elements; Mercury; Carbon nanotubes; Coal rank