

Study Of Coal Cleaning Rejects By FIB And Sample Preparation For HR-TEM: Mineral Surface Chemistry And Nanoparticle-Aggregation Control For Health Studies

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Abstract

Nano-minerals and amorphous nanoparticles play a vital role in the contexts of human health and environmental sustainability. For instance, aerosols generated by the process of coal beneficiation adversely affect human health as well as the environment. These are called Coal Cleaning Rejects (CCRs). They mainly contain clay minerals, nano-quartz, different particles of Fe/Al, and other Hazardous Elements (HEs) and compounds in minute quantities. In this work, we studied the CCRs of industrial facilities in Brazil for the presence of nanoparticles/nanominerals and HEs. CCRs were characterized using Focused Ion Beam (FIB) to evaluate nano-compound assemblages with high resolution-transmission electron microscopy/energy dispersive spectroscopy (HR-TEM/EDS) to assess the extent of risk to human health. In the present work, the importance of nanogeoscience in the description of CCRs and HEs in several secondary phases deposits (e.g. Fe and Al-sulfates, oxides and hydroxides minerals) has been emphasized and the presence of HEs in Brazilian coal abandoned area has been confirmed. This innovative study used an advanced characterization that will be useful in understanding the extent of environmental risk as well as a threat to human health, associated with CCRs.

Keywords

Advanced Characterization; Coal Cleaning Rejects; Focused Ion Beam; High-Resolution Transmission Electron Microscopy; Nanominerals; Nanoparticles.