

NANOMINERALOGY OF EVAPORATIVE PRECIPITATION OF EFFLORESCENT COMPOUNDS FROM COAL MINE DRAINAGE

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ABSTRACT

Efflorescent nanophases (NPs) are found as a transitory accumulation of potentially hazardous elements (PHEs), particularly in tropical climates. The central objective of this study was to investigate the distribution of PHEs with NPs through the evaporative formation structures (EFS) of enormously PHEs-rich coal-mine drainages (CMD). The EFS were studied in natural coal mine drainage for five months in order to determine their geochemical and ecological structures and to assess their position in the reduction of PHEs in nature. The largest coal-fired power plant in South America, located in south Brazil, is used as an example of such a problem. In this work, a novel methodology for the analysis of PHEs in CMD precipitates is proposed for this affected coal area. The analytical method, combining X-Ray Diffraction (XRD) and advanced electron microscopies, shows the importance of nanomineralogy in understanding different circumstances of coal contamination. Several ultrafine-nanoparticles (UNPs) were identified in the sampled soils and river sediments together with the PHEs. A decrease in PHEs was identified in association with UNPs. However, further investigations are required with regard to the mobility of PHEs in water, atmosphere, soils, and sediments. The EPS was thoroughly studied, acquiring suitable understanding with investigational facts for Ca and Fe-sulphates, pickeringite, and several amorphous phases.

KEYWORDS

Coal mine drainage; Evaporative precipitation; Sediments; Water and soil pollution