Implications of iron nanoparticles in spontaneous coal combustion and the effects on climatic variables

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Abstract

Atmosphere, water, and soil contamination with toxic compounds is a recurrent issue due to environmental disasters, coal burning, urbanization, and industrialization, allf of which have contributed to soil contamination over the decades. Consequently, understanding of the nanomineralogy and potential hazardous elements (PHEs) in coal area soil are always a vital topic since contaminated soil can affect the environment, agricultural safety, and human health. Colombian coal mining in the La Guajira zone has been usually been related with important health and ecological effects. Coalmine rejects from active and/or abandoned operations are causes of high intensities of potential hazardous elements (PHEs) and nanoparticles (NPs, minerals and/or amorphous compounds). Although these pollutants can be reduced by sorption to NPs, in this study was recognized an analytical procedure for understand distribution of PHEs and their relationship to iron NPs(Fe-NPs) was recognized. Non and poorrly crystalline Fe-NPs performances as the major PHEs association. This complex interaction is constant and efficient in resolving PHEs in proportions above monitoring quantities. The indefinite basis of PHEs in Colombian (La Guajira area) coalmine rejects sources results in years-long leaching of PHEs into rivers and drainages. The iron-clays and their great geomobility interfere the mitigating character that Fe hydr/oxides alone show through adsorption of PHEs and their control in spontaneous coal combustion (SCC) zones. This can have significant consequences to the probable availability of several pollutants (e.g. drinking water). The new results presented in this study add novel viewpoints into the description of Fe-NPs and its incidence in SCC areas. The methodology utilized in this work can be applied as a supplementary technique to evaluate the influence of coalmining actions on ecological and human health.

Keywords

Iron nanoparticles; Nanominerals; Advanced characterization; Colombian coal area