Elaboration of Clay/Laterite Nanocomposites for the Treatment of Mining Industry Effluents

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ABSTRACT

The objective of this study is to prepare composite materials with improved adsorbent properties for the treatment of mining industry effluents. Mining has boomed in recent decades in the West African sub-region and particularly in Côte d'Ivoire. Thus, several artisanal or semi-industrial units have settled throughout the territory. This activity, although lucrative for the actors, has a negative impact on the quality of life of the terrestrial and aquatic ecosystem. Indeed, metalliferous effluents from these extraction units are major sources of environmental pollution. The environmental and health risks associated with the untreated dumping of mining industry effluents into nature require the search for sustainable solutions. The adsorption method for the removal of metal contaminants has shown high efficiency, cost effectiveness and easy set-up. Among the adsorbents used, the interest in clay is becoming more and more growing because it has a good adsorption capacity vis-à-vis various metal ions, such as arsenic, copper or cadmium. On the other hand, nanocomposites synthesized by incorporating nanostructured materials inside the intercalary space of the clay mineral have attracted increasing interest due to their particular physicochemical properties and their potential application in various fields. To obtain better results for the removal of metallic species from wastewater, nanostructured materials based on clays could become new suitable alternatives. This is why this work is particularly interested in the synthesis of clay nanoparticles, their modification and the formulation of composite materials with improved physicochemical properties. These nanocomposites will be produced from clay and laterite by the mechanochemical method. Two types of clays (kaolinite and smectite) from natural sites will be used for this study. These raw clays will be purified to extract the fine fractions of dimension < 2 µm. The mineralogical characterization of the materials will be carried out by various techniques such XRD, XPS, IR.

Keywords: Clay, Nanocomposite, Adsorption, Mining effluents.

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