# HYBRID MATERIAL BASED ON NATURAL ENVIRONMENTS FOR ADSORPTION STUDY OF METALLIC SPECIES

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Humic substances and clay minerals are the main components of the soils. In natural conditions, these compounds are present in the environment as stable complexes formed by clay-humic associations. Due the physicochemical properties, both materials are able to interact with several contaminants such as toxic metallic species and anions present in soils. In this sense, the present study aimed to evaluate the association of clays minerals and humic substances using two clays minerals: kaolinite (Kao) and bentonite (Ben) and with a humic acid. The complexes clays-humic acid formed and the natural clays minerals were evaluated for their Ni (II) species adsorption capacity. Initially, the association of humic acid and two clays were evaluated and the complexes formed were characterized by powder X-ray diffraction (XRD). In the adsorption study of Ni(II) species the kinetic experiment was made under natural conditions (without stirring and in room temperature). Natural clays after the adsorption studies of the Ni(II) (Ben-Ni(II)) also were evaluated in the complexes formation with humic acid. The results showed that Ben has more affinity with humic acid when compared with Kao clay, and the proportion of the clay mineral to humic acid in the complexes formation were 23:1 and 74:1 for the Ben and Kao, respectively. The adsorption studies showed that 24 hours were time required for the adsorptive processes to stabilize the natural clays. Both natural clays displayed low adsorption capacity of the Ni(II) species. However, a higher affinity was observed between bentonite and nickel ions, probably due the structure of this clay (cationic, swellable), since their basal structures allow the expansion of its interlayer spaces, thus favoring the cation exchange mechanism. XRD showed the variation on typical basal reflection of Ben promoted before association with humic acid, no changes in initial basal spacing was observed. However was possible to observe the amorphization of Ben, due the broadness of reflections, evidencing that presence of humic acid promotes the swollen of Ben. In constrat, the Kao clay not showed any change in the basal space or brodness in typical reflections, confirming that associations of the humic acid occurs only at clay surface in Kao. The complexes formed by the association between humic acid and both clays showed low interaction with Ni(II) species during the kinetic assays, most likely because the oxygenated functional groups present in the humic acid structure interact with the clays by hydrogen bonds blocking, in this way, the possible active sites present in the new hybrid material. However, the association of the Ben-Ni(II) with humic acid showed that the cations on the clay surface could favor the formation the hybrid clay-humic acid.

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