Birnessite synthesis and their application as adsorbents of heavy metals

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Abstract

Birnessite is the most abundant manganese mineral on planet's surface, occurring as fine-grained, poorly crystallized aggregates in soils, sediments, grain, and rock coatings. This non-stoichiometric compound contains MnO_2 layers and a water intermediate layer in which there are usually alkaline cations. Birnessite is well known for its ability to adsorb heavy metals by exchanging Na^+ cations within the intermediate layer. In the research work that is represented by this poster, birnessite is synthesized by a very simple method using $MnSO_4 \cdot H_2O$ and H_2O_2. An extremely fine crystalline material with dark color is obtained. A possible use of this material as environmental cleaning agent, is considered by examining its adsorptive properties towards heavy metals (Cd, Pb, Cu). The synthetized Birnessite was put in contact with heavy metal solutions for different time intervals and the adsorbed amount was measured using AAS (atomic absorption spectroscopy). During the exchange process of heavy metal ions with Na^+ cations, the birnessite intermediate layer outgrows 70 nm. Considering the adsorption graphs the highest adsorbed amount of Cu and Cd was observed at respectively after 12h at 5.8 mg/L and after 10 h at 1.25 mg/L. The adsorption of Pb was very low at the first 10 hours but after that the adsorbed amount increases significantly with much higher amounts compared to others.