

Effects of Ion Adsorption on Charge Properties of Birnessite. (S02-kirk174607-Oral)

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Abstract:

Birnessite oxidizes the more toxic form of As, AsIII, to AsV. Due to the presence of other cations in the environment, it is important to understand the effect cations have on this oxidation reaction. This study assesses the effect of Zn^{2+} , Ca^{2+} , and Ni^{2+} on the charge properties of synthetic birnessite at various pH which could affect oxidation rates of As. Sorption studies were combined with electrophoretic mobility (EM) studies to infer whether or not the cations form inner- or outer-sphere complexes with the birnessite surface. Preliminary results show that Ca and Zn increasingly sorb onto the birnessite surface as the pH rises from 4 to 8. EM studies show whether there is an increase, a decrease, or no change in birnessite's point of zero charge (pzc) as the cation sorbs to the surface. If there is a shift in the pzc, it is inferred that an inner-sphere complex is forming. Cations that form inner-sphere complexes should compete more with AsIII for surface sites compared to cations that form outer-sphere complexes, and thus decrease the oxidation rate of AsIII. Future studies will directly show the effect of Zn, Ca, and Ni on the AsIII oxidation reaction by birnessite.

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