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57-13 Ni²⁺ Sorption on Biogenic Manganese Oxides Formed at Various Phs

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As a scavenger of heavy metals, manganese oxides play a critical role in controlling the fate and transport of heavy metals in the environment. Biogenic manganese oxides are thought to be prominent in many environmental settings. Our previous study showed that the density of vacancy sites and Mn(III) abundance in biogenic manganese oxides are dependent on the pH at which biological Mn(II) oxidation occurs. To investigate whether these biogenic Mn-oxides will exhibit significant differences in their retention of heavy metals, nickel (Ni) sorption on the biogenic manganese oxides formed at pH 6, 7 and 8 (BioMnOxpH6, BioMnOxpH7, BioMnOxpH8) was conducted in a 0.05M NaNO₃ background electrolyte at pH 7 at 23 ± 1 oC. Sorption samples were analyzed by X-ray absorption fine structure (XAFS) spectroscopy and synchrotron-based-XRD. Sorption isotherms showed that BioMnOxpH6 had a slightly higher adsorption capacity than the other two oxides. Preliminary analysis of XAFS data indicated that Ni²⁺ was mainly adsorbed above or below vacancy sites in BioMnOxpH6 while Ni²⁺ was incorporated into the Mn(III,IV) layers in BioMnOxpH8 in addition to adsorption on vacancy sites. Incorporation of Ni²⁺ into the structure of manganese oxides may indicate low sorption reversibility.

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