



GEOC 8: Effects of halide ions on photochemically-induced abiotic formation of Mn oxides

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Body

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Manganese (Mn) oxides have excellent oxidation and adsorption capabilities that can affect geochemical element cycling and the fate of pollutants in the environment. Naturally existing Mn oxides are believed to be formed mainly by oxidation of $\text{Mn}^{2+}(\text{aq})$ mediated by fungi or bacteria, while abiotic Mn oxidation has been considered a minor contribution due to its slow kinetics. However, in a recent study, we discovered abiotic inorganic oxidation of $\text{Mn}^{2+}(\text{aq})$ to $\delta\text{-MnO}_2$ by superoxide radicals generated from nitrate photolysis at a rate comparable to that of biotic processes. In the current study, we investigated the effects of abundant halide ions (such as Cl^-) on photochemically-driven oxidation of $\text{Mn}^{2+}(\text{aq})$. Halide ions are abundant in the environment and many engineered systems, including seawater and blackish water, as well as effluent water from desalination and unconventional oil and gas recovery. Halide ions can participate in photochemical Mn^{2+} oxidation reactions by forming additional radicals. We found that in the presence of halide ions, the oxidation rates of Mn^{2+} and quantities of formed Mn oxides were both increased. In addition, high concentrations of halide ions greatly changed the ionic strengths of the systems, affecting the crystallinity of the resulting Mn oxide. Our findings highlight unexpected impacts of halide ions on solid formations in surface water rich in halides.

Presentation Details



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Monday, Aug 17 8:00 AM

On Demand Oral



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Monday, Aug 17 1:00 PM

Broadcast

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