Effects of Solution Conditions on Bisphenol A Oxidation by Manganese Oxide

SARAH BALGOOYEN,* [1] CHRISTINA K. REMUCAL,[1,2]
MATTHEW GINDER-VOGEL[1,2]

[1]Environmental Chemistry and Technology Program, University of Wisconsin-Madison; *correspondence: balgooyen@wisc.edu

[2]Department of Civil and Environmental Engineering, University of Wisconsin-Madison

Manganese(III/IV) oxides are strong oxidants found in a wide range of natural environments. Bisphenol A (BPA) is a phenolic compound and an environmental contaminant found at concentrations that are considered harmful for aquatic life. One degradation pathway of BPA is through oxidation by reactive manganese oxides. Here we observe changes in mechanism and products of BPA oxidation by δ-MnO_2 using stirred-flow and batch reactors at varying loading rates and solution pH. Loading rate, or BPA introduction rate, is investigated by changing mobile phase concentration of BPA in stirred-flow reactors. 4-Hydroxycumyl alcohol (HCA), a major BPA oxidation product, is detected in the reactor effluent and used to probe the production of organic products by radical coupling. These reactions show that both BPA oxidation products and δ-MnO_2 transformation are affected by loading rate, indicating a shift in mechanism depending on the influent concentration of BPA. Solution pH is investigated using batch reactors buffered at varying environmentally relevant pH values. These studies show that both the rate of BPA oxidation and HCA production is affected by solution pH, indicating a shift in mechanism based on solution acidity. The oxidation mechanism and products of BPA and other phenolic contaminants is important to both water treatment and groundwater quality and remediation.