

Fundamental Aspects of Mn Oxide Reactions with Catechol.

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Oxidizable organic ligand interactions with soil Mn(III,IV) (hydr) oxides minerals are complex. Accordingly, an in situ electron paramagnetic resonance stopped-flow spectroscopic technique was combined with batch techniques to measure the reductive dissolution kinetics of birnessite (δ -MnO(₂), a common soil Mn mineral, by catechol (1,2-dihydroxybenzene). The reaction was rapid, independent of pH, and essentially complete within seconds under conditions of excess catechol at pH 4 to 6. The activation energy value of 58.7 kJ mol⁻¹ indicated that the reaction was surface chemical controlled. Rates of catechol disappearance from solution with simultaneous Mn(II) and ortho-quinone production were comparable. The efficiency and rapid reductive dissolution kinetics of birnessite by catechol could have significant implications for C and Mn cycling in soils.

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