

## **Contaminant Degradation by •OH during Sediment Oxygenation: Dependence on Fe(II) Species**

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It has been documented that contaminants could be degraded by hydroxyl radicals (•OH) produced upon oxygenation of Fe(II)-bearing sediments. However, the dependence of contaminant degradation on sediment characteristics remains elusive. Here we assessed the impact of the abundance of Fe(II) species, particularly surface-adsorbed and mineral structural Fe(II), in sediments on contaminant degradation by •OH during oxygenation. Three natural sediments with different Fe(II) contents and species were oxygenated. During 10 h oxygenation of 200 g/L sediment suspension, 2 mg/L phenol was negligibly degraded for sandbeach sediment (Fe(II): 5.93 mg/g), but was degraded by 41% and 52% for lakeshore (Fe(II): 9.02 mg/g) and farmland (Fe(II): 22.62 mg/g) sediments, respectively. •OH produced from Fe(II) oxygenation was the key reactive oxidant. Sequential extractions, X-ray diffraction, Mössbauer and X-ray absorption spectroscopy suggest that surface-adsorbed Fe(II) was reactive, and mineral structural Fe(II) associated with phyllosilicates like smectite was reactive but with carbonates, magnetite and some other silicates was almost nonreactive. The identified dependence of contaminant degradation by •OH on Fe(II) species upon sediment oxygenation may assist in assessing contaminant attenuation in subsurface perturbed by O<sub>2</sub>.