Kinetic and Microscopic Studies of Reductive Transformations of Organic Contaminants on Iron Oxides

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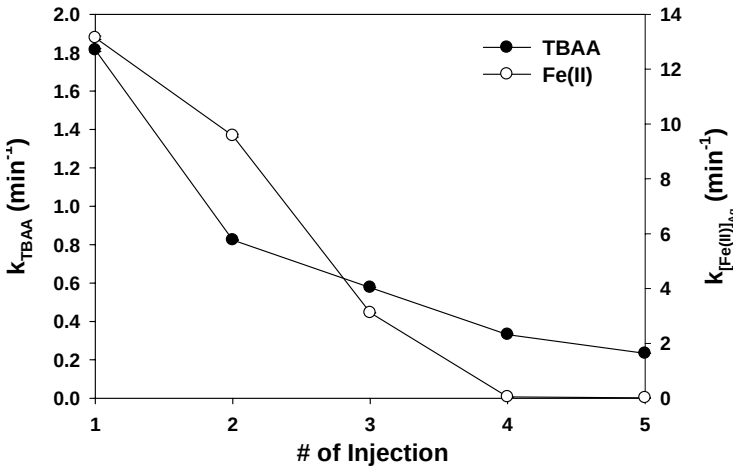
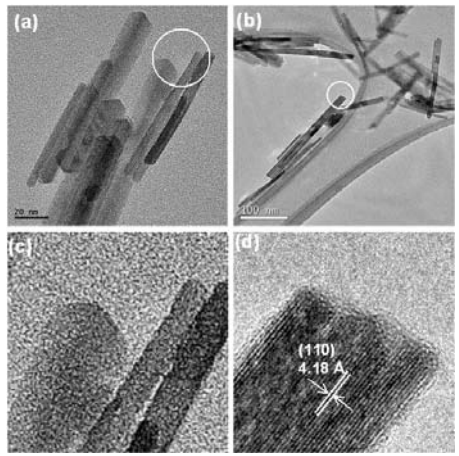
- DESCRIPTION OF WORK
  - Investigate evolving reactivity of iron oxide minerals
  - Identify changes in iron oxides particle size, morphology, and phase



Reduction rate constants of tribromoacetic acid and rate constants of aqueous Fe(II) loss as a function of number of injections in the presence of 0.57 g/L goethite (initial), 1 mM total Fe(II), and an initial concentration of 200 μM TBAA at pH 7.

- MAJOR OBSERVATIONS
  - Goethite partilce grew in the *c*-direaction and particle tips became poorly faceted with subsequent reactions
  - Such reactions are controlled primarily by the solid-state as opposed to the structure of the molecule undergoing the degradation.



TEM images of (a) goethite particles before reaction and (b) goethite particles after the fifth reaction with 4-chloro-nitrobenzene. A magnified image of pre-reaction goethite particle tips (c) and a high-resolution TEM image (d) obtained from image of (b) are also shown. The post-reaction particles are longer and the tips are no longer faceted. The d spacing in image (d) shows that the newly formed material is goethite.

- Publications

Chun, Chan Lan, Penn, R. Lee, and Arnold, William A.,2006, "Kinetic and microscopic studies of reductive transformations of organic contaminants on goethite", *Environmental Science and Technology*, Vol. 40, No. 10, 3299-3304.