Effects of pH and ionic composition on sorption/desorption of natural organic matter on zero-valent iron and magnetite nanoparticles

SUPPLEMENTARY MATERIAL

Characterization of Fe\(^0\) and Fe\(_3\)O\(_4\) nanoparticles

The techniques of TEM, specific surface area (BET) and Raman spectroscopy were used to characterize structure and properties of nanoparticles, as we did in our previous work (Chen et al. 2011; Zhao et al. 2014). A drop of ethanol solution containing nano-Fe\(^0\) or nano-Fe\(_3\)O\(_4\) was put on 200-mesh holey carbon-coated copper grids; after drying, the sizes and shapes of Fe\(^0\) and Fe\(_3\)O\(_4\) nanoparticles were characterized by TEM (Figure S1).

Figure S1 | TEM images of nano-Fe\(^0\) (a) and nano-Fe\(_3\)O\(_4\) (b).

Characterization of structure and properties of nanoparticles was also carried out by specific surface area (BET) and Raman spectroscopy. The BET method was used to determine the surface area, pore size, and pore volume of the nanoparticles, while the Raman spectrum provided information on the chemical bonding and vibrational modes of the nanoparticles.

Figure S2 | Raman spectra of nano-Fe\(^0\) (a) and nano-Fe\(_3\)O\(_4\) (b).

Adsorption isotherms of HA on nano-Fe\(^0\) and nano-Fe\(_3\)O\(_4\) nanoparticles were obtained using the Langmuir and modified Langmuir isotherms. The adsorption capacities of HA on nano-Fe\(^0\) and nano-Fe\(_3\)O\(_4\) nanoparticles at various HA equilibrium concentrations were measured and compared.

Figure S3 | Adsorption isotherms of HA on nano-Fe\(^0\) and nano-Fe\(_3\)O\(_4\). Solid line, Langmuir isotherm; dotted line, modified Langmuir isotherm. (0.5 g/L nanoparticles, 0.01 M NaCl, pH = 7.0, T = 25°C).
nanoparticles were observed with TEM (Hitachi H-8100) (Chen et al. 2011). The N₂-BET specific surface area of the nanoparticles was measured (four-point isotherm) using an Autosorb-iQ2 MP BET surface area analyzer (Quantachrome). All samples were outgassed for 2 h. A known weight of dry samples was measured using N₂ sorption at 77.3 K (Zhao et al. 2011). The Raman spectra of Fe⁰ and Fe₃O₄ nanoparticles were obtained using laser confocal Raman spectroscopy (Renishaw inVia plus). The spectra data were collected from 100 to 1,800 cm⁻¹ at 514 nm excitation (Gao et al. 2011).

**REFERENCES**

