

## Sorption of oxytetracycline on magnetite-water interface

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Oxytetracycline (OTC) is one of the most common veterinary antibiotics detected in wastewater, surface water, and soils. Few reports are available on the environmental fate of OTC. While there are some studies on the sorption of OTC on iron oxides [1], little information is available regarding its interaction with magnetite (Fe<sub>3</sub>O<sub>4</sub>) - an iron oxide with mixed oxidation state. This information would be essential in modeling the fate and transport of OTC in environments where Fe<sub>3</sub>O<sub>4</sub> dominates. In addition, Fe<sub>3</sub>O<sub>4</sub> appears as a secondary product in treatment technologies that employ zero-valent iron as a sorbent for permeable reactive barriers. The primary objective of this study was to elucidate the sorption behavior of OTC on Fe<sub>3</sub>O<sub>4</sub>. Batch sorption experiments were carried out as a function of equilibration time (1 min-48 h), pH (3-10), ionic strength (0.01-0.5 M KCl) and initial OTC concentration (0.1-2 mM OTC) under anaerobic conditions. Magnetite was used at a concentration of 20 gL<sup>-1</sup> in all sorption studies. Preliminary results indicate that sorption of OTC by Fe<sub>3</sub>O<sub>4</sub> is rapid and nearly complete at 5 h. Sorption isotherm reached a plateau within 48 h. The pH-edge data indicate that with increasing pH, OTC sorption by Fe<sub>3</sub>O<sub>4</sub> decreased, suggesting a possible combined effect of Fe<sub>3</sub>O<sub>4</sub> surface charge and OTC speciation on sorption. Sorption isotherm data was fitted to the Langmuir model. A range of Langmuir parameters (b= 0.081-0.047 mMg<sup>-1</sup>, k = 39-191 LmM<sup>-1</sup>) for ionic strengths ranging from 0.01-0.5 M were obtained. The effect of ionic strength on sorption was negligible at initial OTC concentrations ranging between 0.1-1 mM. However, at higher initial concentrations (>2 mM), OTC sorption was a function of ionic strength, possibly indicating a different sorption mechanism. Surface complexation modeling of Fe<sub>3</sub>O<sub>4</sub>-OTC interactions is currently in progress. Spectroscopic studies are necessary to elucidate sorption mechanism. Preliminary results from this study indicate potential for use of Fe<sub>3</sub>O<sub>4</sub> as a sorbent for OTC.

[1] Figueroa & Mackay (2005), *Environ. Sci. Technol.* **39**, 6664-6671.

## Assessment of heavy metal pollution in sediments of Kazipalli watershed, northwest of Hyderabad (India) by wavelength dispersive X-Ray fluorescence spectrometry

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The contamination of natural systems by heavy metals is of major concern especially in many industrialized countries because of their toxicity, persistence and bioaccumulative nature. The objective of this study is to investigate the contamination levels and dispersion pattern of heavy metals (As, Cd, Co, Cr, Cu, Ni, Pb, V and Zn) in sediments of Kazipalli watershed, northwest of Hyderabad, India. The Kazipalli watershed consists of an industrial area comprises intense chemical, pharmaceutical and pesticide manufacturing industries. The watershed is spread over 37.15 sq km with crisscrossed by intermittent streams and their water conserved in a chain of small picturesque lakes called 'cheruvus'.

Sediments were collected ( $n = 23$ ) from different lakes and streams flowing into the lakes, have been analyzed for their heavy metal content using Wavelength Dispersive X-Ray Fluorescence (WD-XRF) Spectrometry. The results show that sediments from the lake 'Kazi cheruvu' and streams connecting to this lake contain highest concentrations of As (961.7 mg/kg), Cd (116 mg/kg), Cr (512.8 mg/kg), Pb (2043.6 mg/kg) and Zn (504 mg/kg) than the other lakes in the study area. Concentrations of heavy metals found in sediments are exceeding the prescribed limits by Regulatory agencies. The correlation analysis of concentration data showed positive correlations ( $r^2 = 0.99$ ) among As, Cd, Zn, Pb, Co Cu, V and Ni indicating that the contamination is from the identical source. These elevated heavy metal concentrations were ascribed to the untreated open discharge of industrial waste water via streams in to the lakes. Further studies will be required for speciation of various chemical forms of the heavy metals to assess their bioavailability and toxic effects to the aquatic life.