

## Arsenate precipitation: An alternative fate of As in soils contaminated with mine-related wastes

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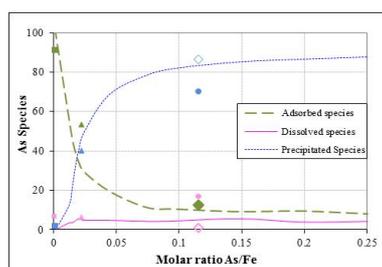
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### Introduction

Arsenic and heavy metals are highly abundant elements in soils contaminated with mining and metallurgical wastes [1]. The final fate of arsenic in aerated environments is usually reported as As(V) bound to iron oxide surfaces [2]. However, we have found evidence of an alternative mechanism as insoluble heavy metal arsenates [3]. In this work we investigate the conditions that favor one mechanism over the other by both modeling and experimental methods. We applied a triple layer surface complexation modeling scheme [4] simultaneously with arsenate precipitation equilibria to predict the speciation expected as a function of total As/Fe ratios, and pH in a simple goethite /Pb(II)/ carbonate system, and compared the results with experimental data under selected conditions.



**Figure 1:** As(V) species distribution in goethite/Pb(II)/ carbonate systems. Model and experimental results at pH 7.

### Discussion of Results

Adsorption processes only prevail at very low As/Fe ratios, and precipitation as Pb(II) arsenate quickly becomes predominant (Fig. 1). Modeling results as a function of pH will also be presented.

[1] Vaughan (2006) *Elements* **2**, 71–75. [2] Foster *et al.* (1998) *Am. Mineral* **83**, 553–568. [3] Villalobos *et al.* (2010) *Aquat. Geochem.* **16**, 225–250. [4] Salazar-Camacho & Villalobos (2010) *Geochim. Cosmochim. Acta* **74**, 2257–2280.

## Microbial and photochemical mineralization of dissolved organic carbon from big rivers

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We addressed the potential for microbial and photochemical mineralization of dissolved organic carbon (DOC) from ten big rivers. In order to quantify the direct photochemical mineralization of DOC to CO<sub>2</sub>, the sterile-filtered river waters were irradiated with an artificial solar radiation until photochemical reactions photobleached chromophoric dissolved organic matter (CDOM) completely. For the assessment of biological mineralization of DOC, irradiated waters and their dark controls received nutrients and indigenous microbes from rivers. The concentration of DOC was followed over one year to quantify the amount of DOC consumed by microbes. Photochemical reactions mineralized DOC directly to CO<sub>2</sub> and also produced biologically available photoproducts. The magnitude of photoreactive DOC depended on the magnitude of CDOM. A part of DOC was resistant to photoreactions but was decomposed with low rate by microbes.