

Light-induced oxidation of Sb(III) in ferrihydrite suspension

LINGHAO KONG, MENGCHANG HE*

State Key Laboratory of Water Environment Simulation, School of Environment, Beijing Normal University, Beijing 100875, P.R. China. Email: hemc@bnu.edu.cn

Introduction

The toxicity and mobility of antimony (Sb) are strongly influenced by its redox processes[1]. Ferrihydrite (Fh) is widely distributed in the environment. In this study, the mechanisms of Sb(III) photooxidation in the presence of ferrihydrite were investigated systematically.

Results and Discussion

Our study indicated that Sb(III) was oxidized to Sb(V) both in the solution and on the surface of Fh under light illumination at pH 3, 5, 7 and 9. Photooxidation of Sb(III) occurred through electron transfer from Sb(III) to Fe(III) on the surface of Fh along with the reduction of Fe(III) to Fe(II) through a ligand-to-metal charge-transfer (LMCT) process. In circumneutral and alkaline conditions, an intermediate oxidation species, speculated as Fe(IV), formed in the process of Fe(II) oxidation, which could promote Sb(III) oxidation. In addition, the mobilization of Sb was greatly influenced in Fh suspension under light illumination. In acidic conditions, Sb tends to adsorb on Fh; However, in alkaline conditions, Sb was released into the solution along with Sb(III) photooxidation in Fh suspension. In conclusion, Sb(III) can be oxidized to Sb(V) in the presence of Fh under light illumination, which will greatly influence the fate of Sb in the environment.

[1] Filella M, Belzile N, Chen YW (2002): Antimony in the environment: a review focused on natural waters II. Relevant solution chemistry. *EARTH-SCI REV* 59, 265-285