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Footprints in the Landscape: Sustainability through Plant and Soil Sciences

Speciation and Release Kinetics of Cadmium in Alkali and Acidic Paddy Soils: Application of X-Ray Absorption Spectroscopy (XAS).

*Monday, November 2, 2009: 10:30 AM
Convention Center, Room 330, Third Floor*

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Cadmium is one of the most toxic elements to humans. One of the main routes of exposure is the consumption of contaminated grain, especially from rice which is grown in Cd-contaminated soil. The toxicity and bioavailability of a metal are determined more by its form than its total concentration. Metal speciation in contaminated soils is a prerequisite for predicting environmental risks and for developing efficient and cost-effective remediation measures. Soil pH is one of primary factors that controls Cd bioavailability in paddy soils. Cd may be present as different species under alkali and acidic conditions. X-ray absorption spectroscopy (XAS) was used to investigate Cd and S speciation in alkaline and acidified Cd-Zn co-contaminated paddy soils. Bulk extended X-ray absorption fine structure (EXAFS) spectroscopic data indicate that CdCO₃ and Cd-humic complexes are the predominant Cd species in the alkaline soil, while CdS and CdCO₃ are the major species in the acidified soil. X-ray absorption near edge structure spectroscopy (XANES) data revealed multiple S valence states (e.g., S(-II), S-thiol group and S(-VI)). X-ray micro fluorescence (μ -XRF) spectroscopic images showed that Cd tends to be diffusely distributed throughout the soil. Stirred-flow kinetic experiments show that Cd release from acidified soil is higher than from alkali soil, and is initially rapid followed by a gradual slow release at longer time periods in both soils. Elucidation of Cd speciation and release kinetics in alkali and acidified Thai paddy soils is crucial to developing and implementing best management practices needed for productive agriculture in Cd and Zn contaminated areas.

See more of: [Chemical and Biological Controls On Metal Bioavailability: I](#)