UTSA Earth and Planetary Sciences

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Institute for Water Research Sustainability and Policy (IWRSP)

Seminar Presentation

By

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"The role of nanosized iron particles in achieving the 'Closer to Zero' initiative"

Abstract

Chronic exposure of humans to elevated concentrations of heavy metals—such as arsenic, lead, cadmium, and mercury—results in serious health and developmental problems. The occurrence of heavy metals in food (even at low levels) is therefore a serious concern as it is a direct, prolonged route of human exposure to the toxic metals. The need to curb widespread occurrence of heavy metals in baby foods led to the creation of the 'Closer to Zero' initiative by the US Food and Drug Administration (FDA). Our group is engineering iron-based nanoscale materials to address one of the major ways heavy metals enter the human food chain, uptake by food crops during cultivation. In this seminar I will describe two studies in which our group employed the chemistry of nanoparticulate iron (Fe) for addressing the heavy metal challenge in agriculture. In the first study we investigated the performance of pristine and sulfidated nanoscale zerovalent iron (NZVI and SNZVI, respectively) for simultaneous removal of copper (Cu2+) and phosphate (PO43-), which are typically present in non-traditional irrigation water. Surface reactions with Fe led to improved simultaneous removal when both contaminants were present in water. The relative importance of input parameters was calculated based on an artificial neural network function developed from experimental data. In the second study, we showed that arsenic immobilization in soil can be improved with Fe sulfidation. Ongoing studies are investigating the suitability of NZVI- and SNZVI-treated heavy metal-contaminated soil for crop cultivation.