DEPARTMENT OF CIVIL AND ENVIRONMETAL ENGINEERING

Environmental and Water Resources Engineering Seminar

Alyssa R. Deline

Postdoctoral Fellow, Johns Hopkins University and the NSF Center for Sustainable Nanotechnology

"Analytical Approaches for the Sustainable Application of Nanotechnology"

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11:00 AM

111 SEC Lincoln

160 PKI Omaha

Alyssa R. Deline

Securing the health and prosperity of future generations requires the sustainable and safe application of emerging technologies. Engineered nanomaterials are one such technology, widely utilized in many consumer products and industrial applications. Given the steady rise in the development, production, and use of engineered nanomaterials, it is necessary to examine their potential toxicity and environmental impact. However, research in this area is complicated by the challenge of distinguishing engineered nanomaterials from the surrounding sample matrix, which often contains high concentrations of the element of interest. In the first part of the presentation, I will discuss the development and utility of gold core-labeled titanium dioxide nanoparticles as a strategy for quantifying nanomaterials in environmentally relevant systems. The labeled particles were characterized and compared to their unlabeled counterparts, then quantified in complex samples like activated sludge. In the second part of the presentation, I will discuss the potential applications of nanotechnology to global challenges in food security. Nanomaterials can be used to enhance agricultural yields while mitigating negative impacts caused by the broad application of conventional fertilizers. Phytoglycogen nanoparticles (PhG NPs), renewable polysaccharide particles naturally produced in corn, offer distinct advantages as a delivery platform. In this work, zinc nutrients were embedded within the dendritic structure of the PhG NPs, while the PhG surface chemistry was modified to optimize binding to plant surfaces (e.g. hydrophobic leaves or roots). Analytical strategies including x-ray photoelectron spectroscopy and quartz crystal microbalance were used to gain a fundamental understanding of attachment behavior using model hydrophobic surfaces. Ultimately, this approach can be extended to a variety of nutrients and pesticides using the same renewable delivery platform.