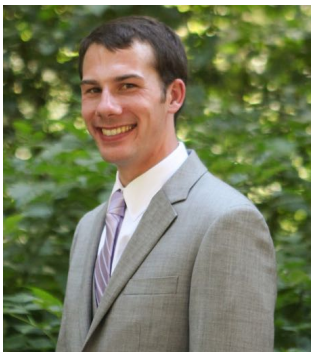
CHEMICAL ENGINEERING

DISTINGUISHED YOUNG SCHOLARS SERIES



MARK HENDRICKS

Monday, June 27, 2016

Postdoctoral Fellow
Northwestern University

Using Precursors to Control Nanomaterial Synthesis: A Tunable Library of Substituted Thiourea Precursors to Metal Sulfide Nanocrystals

ABSTRACT: Controlling the size of colloidal nanocrystals is essential to optimizing their performance in optoelectronic devices, catalysis, and imaging applications. Traditional synthetic methods control size by terminating the growth, an approach that limits the reaction yield and causes batch-to-batch variability. I will describe the development of a library of substituted thiourea compounds whose substitution pattern tunes their conversion reactivity over more than five orders of magnitude. The faster thiourea conversion kinetics increases the extent of crystal nucleation, thereby enabling rational control over nanocrystal concentration and thus crystal size at full conversion. Interestingly, nuclei concentration is not linearly dependent on precursor conversion rate as predicted by Sugimoto ſs mass-balance model of crystal nucleation and growth. Controlled precursor reactivity and quantitative conversion improve the batch-to-batch consistency of the final nanocrystal size at industrially relevant reaction scales. I will also highlight the ability to use precursor kinetics to influence the properties of more complex systems, including control over nanorod aspect ratio and core/shell heterostructure grading.

BIOGRAPHY: Mark Hendricks grew up in Richland, Washington, where he began his research career as an intern at Pacific Northwest National Laboratory. He obtained a B.S. from Harvey Mudd College and a Ph.D. in chemistry from Columbia University. He is currently a postdoctoral fellow in the Stupp Laboratory at Northwestern University where he is investigating the self-assembly of supramolecular polymers and the integration of these systems with functional inorganic structures. Mark is interested in the synthesis and self-assembly of nanocrystals and organic/inorganic hybrid nanomaterials.

LECTURE 4:00 – 5:00 (PAA) A110
Happy Hour in Benson Hall Lobby Following

CHEMICAL ENGINEERING
UNIVERSITY of WASHINGTON
Knowledge and solutions for a changing world