MSE SEMINAR

March 30, 2018
113 McBryde Hall
3:30 – 4:30 PM
Refreshments at 3:00 PM

Nizar Zahed

Graduate Student
Materials Science and Engineering, Virginia Tech

"Controllable morphology of multi-scale porous titanium dioxide"

ABSTRACT

Titania samples exhibiting a multi-scale pore size distribution are prepared by a facile, rapid technique via hydrolysis of titanium tetra-isopropoxide (TTIP) using varying H_2O/TTIP ratio values, different drying methods, and with/without the use of isopropanol as solvent. The effect of these parameters on the pore size distribution, particle size, morphology, and crystallinity are systematically studied. Electron microscopy reveals the synthesis of 5-15 nm nanoparticles assembled into multi-scale structures with macrochannels of 1-3 μm in diameter as well as inter-particle and inter-agglomerate pores ranging from one to a few hundred nanometers in size. Hydrolysis in excess H_2O increases the frequency of the macrochannels and increases particle packing in the struts, while the introduction of isopropanol dramatically decreases their presence and renders more homogeneous microstructures. This simple and fast approach contrasts dramatically with previous, much more complex and ingredient-heavy recipes, and enables the synthesis of crystalline titania nanoparticles, assembled in multi-scale porous patterns with just three reactants in less than 12h, without the need for surfactants, dispersants, pH adjustments, or sintering.

BIOSKETCH

Nizar Zahed is an accelerated Masters student (graduating June, 2018) jointly advised by Dr. E. Johan Foster and Dr. Carolina Tallón. He graduated from Virginia Tech in May 2017 as the MSE Outstanding Senior of the Year with a dual degree in Materials Science and Engineering (MSE), and Mathematics and a minor in Classical Studies and recently received the Dr. Gary S. Clevinger, Sr. Memorial Endowed Scholarship. He attended the International Conference and Expo on Advanced Ceramics and Composites in January, where he presented the results he will discuss today.

Nizar serves as a Graduate Teaching Assistant helping with "Elements of Materials Science" in Fall 2017 and currently with "Transport Phenomena in MSE". He spent Summer 2018 working with Pratt & Whitney and will be joining their Materials and Processes Engineering division after graduation. His current research focuses on the facile formation of multi-scale porous ceramics by self-assembly and cellulose templating techniques for simple, fast production of highly porous materials for applications ranging from photocatalysis to ultra-high temperature insulation of hypersonic vehicles.