MATERIALS SEMINAR

Date: Monday, Oct. 10

Time: 3:30 pm, 1315 Chemistry

Prof. James F. Cahoon

University of North Carolina at Chapel Hill

"Architectural Nanomaterials: Designing Semiconductor Morphology so Form Follows Function"

Semiconductors are used in a vast array of modern technologies, including solar cells that convert sunlight into electricity and microprocessors that drive computers. They can be used to direct the flow of energy in devices or to convert energy from one form to another. These functions are enabled by the specific choice of material and composition. Shape, however, is another fundamental characteristic that can be used to encode functionality. Here, I will describe my group's efforts to use nanometer-scale morphology as a strategy to encode novel photovoltaic, electronic, and optical properties in materials created by bottom-up methods. We chemically synthesize nanostructures, such as metal oxide particles and group IV nanowires, with precise morphology and composition, and we evaluate their physical properties using nanofabrication, spectroscopic, electrochemical, and computational methods. For instance, I will describe a strategy to create silicon nanowires with lithographic-like patterns, enabling applications ranging from photonic crystals to non-volatile memory.

In addition, Prof. Cahoon will outline efforts to design wide-bandgap photocathode materials for integration in solar fuels devices. The results yield insights into the synthesis, structure-function relationships, and technological applications of designed, bottom-up semiconductor nanomaterials.