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Title: Studies on Cu_2O and Delafossite-Based Electrodes for Use in Solar Energy Conversion

Abstract: Energy demands are expected to double by 2050.[1] One approach to satisfy these demands is to develop new materials, reactions, and processes that capture, convert, and store solar energy that can reach global energy markets. This presentation will focus on research into electrochemical synthesis of inorganic metal oxides in an effort to create materials that can be used to split water into H_2 and O_2 with solar energy. This technique is a clean technology to support a hydrogen economy, and as an inexpensive and scalable technique, has the potential for large-scale implementation. Chemistry disciplines covered in the talk will include inorganic, solid-state, materials, and electrochemistry for clean energy applications.

The research focuses on design, synthesis, and characterization of thin film-type electrodes (semiconducting and metallic crystals) with controlled microstructures (nanometer scale) for use in electrochemical and photoelectrochemical devices. In order to improve their properties, it is important to study the surface interactions between the crystals and other materials and electrolytes. It is also imperative to study how surface termination of metal oxide crystals vary with shape, which may be the cause for the variety of electronic and photoelectrochemical properties and activities that are observed experimentally. Synthesis of the thin film electrodes involves using simple electrochemical methods to produce the desired material(s) with tailored surface terminations for enhanced catalytic ability. The semiconductor materials are characterized using scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDS), and X-ray diffraction (XRD).

[1] Nocera, D. G., *Energy and Environmental Science* **2010**, 3, 993.