

## **IN-SITU DIFFRACTION: AN IMPORTANT TOOL FOR THE DEVELOPMENT OF RENEWABLE ENERGY TECHNOLOGIES**

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Sandia National Laboratories is active in the development of renewable energy technologies for improved stability and delivery of power systems, while protecting the environment. This presentation will give an overview of several programs active at Sandia in areas related to the development of renewable energy technologies. In-situ diffraction characterization will be highlighted with respect to these programs to demonstrate the importance of the technique as a diagnostic tool.

Conversion of CO<sub>2</sub> back to fuel can have a net negative carbon footprint. The first portion of the presentation will discuss Sandia's Sunshine-to-Petrol program which seeks to use focused sunlight to as a means of cracking CO<sub>2</sub> gas to form Syngas. Application of in-situ high-temperature XRD to the characterization of various active materials used in the cracking reaction shall be given.

The second part of the talk will address ongoing R&D of Li-ion battery systems. These energy storage systems are ubiquitous throughout our economy and will likely play an important role in future transportation applications. Development of protocols for in-situ XRD and in-situ neutron diffraction on functional electrochemical cells will be presented. Difficulties in data analysis will be outlined, as well as how these may be overcome by employing multivariate analysis techniques.

The third portion of the presentation will discuss research involving erbium metal as an occluder material for hydrogen. While Sandia's research in this arena does not specifically pertain to hydrogen storage, the employment of in-situ neutron diffraction for materials characterization at pressure and temperature has implications for the larger interest in hydrogen storage research.

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