

Project Title:

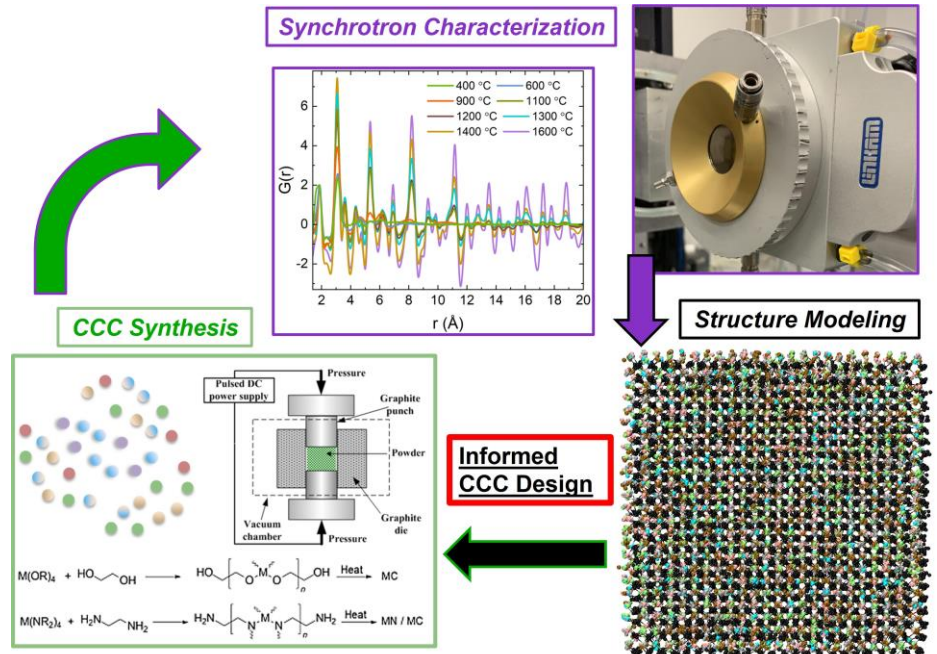
Understanding Structure-Function Relationships for Chemically Complex Ceramic Materials

Supervisor:

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Project Summary:

Chemically complex ceramics (CCCs) are an exciting class of materials that exhibit unusual yet exciting thermal, mechanical, optical and catalytic properties. The complexity of these materials makes it difficult to use rational design strategy, where Edisonian approaches are used to hopefully obtain materials with desired properties. In this project, we aim to remove the guesswork out of CCCs creation by



constructing structure/function relationships using a suite of synchrotron characterization tools. Materials will be generated using a range of traditional powder sintering approaches, along with polymer templates approaches to create a range of CCCs based on carbides, nitrides, and/or borides. Stochastic modeling approaches of synchrotron datasets will provide insights into the local and nano-scale structures, providing a means to build structure/function relationships to better understand the origin of materials properties. This project is funded by the Air Force Office of Scientific Research and involves the use of synchrotron facilities in Australia, the US and Europe and will involve collaborations across Schools at UNSW and at the US Air Force Research Laboratory.

Key techniques: X-ray adsorption spectroscopy and high-energy XRD methods will be central to this project's success. A prospective student must be interested in understanding the fundamentals of such experiments. The project involves a multidisciplinary team in Australia and the US and must be able to work in a highly collaborative environment.

Environment: The project will be undertaken with the [Bedford Research Group](#) in the School of Chemical Engineering.

For further information, please visit:

www.bedfordresearchgroup.com

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