

## Project Title:

Single Atom Catalysts and Nanoclusters Supported on Nanoscale Silicon Carbide/Nitrides for the Partial Oxidation of Methane using Tunable Preceramic Polymer Templates

## Supervisors:

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## Project Summary:

The partial oxidation of methane is an intriguing route toward the production of syngas at stoichiometries directly amendable to methanol synthesis and/or Fischer-Tropsch reactions. This reaction is notoriously tricky to maintain, as it is often plagued with selectivity issues (i.e. total oxidation to CO<sub>2</sub>), or catalyst deactivation through coke formation. Additionally, the understanding of catalyst processing and structure is poorly understood, limiting logical decisions on catalyst design. This project aims to develop new materials with improved reactivity

using single atom catalysts supported on silicon carbide/nitride supports made via block copolymer templating approaches. Preceramic polymers act as a precursor to form silicon carbide/nitride nanomaterials, while blending with appropriate catalyst metal precursors yields the final catalyst. To best understand how the materials are formed during processing and during partial oxidation of methane reactions, in-situ synchrotron characterization methods will be used to form structure/function relationships for these novel materials. The PhD project is funded through the American Chemical Society's Petroleum Research Fund, and will necessitate an array of skills including particle synthesis, materials characterization and catalytic performance assessment. The student will be expected to participate in the Annual ACS Spring Meeting in Years 2 and 3 of their PhD.

**Key techniques:** Block copolymer template formation, high temperature ceramic processing, gas phase thermal catalysis, materials characterization including transmission electron microscopy and synchrotron characterization methods such as X-ray absorption spectroscopy and high-energy X-ray diffraction

**Environment:** The project will be undertaken within the [Bedford Research Group](#) in the School of Chemical Engineering, which is part of the [Particles and Catalysis Research Group](#)

For further information, please visit:

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