

## Dean's Colloquium

Dr. Thabiso Kunene, Assistant Professor

Department of Chemistry and Biochemistry



**When: Wednesday, February 7, 2024**

**Where: Turner 129**

**Time: 3:00 – 3:20 pm, Q&A: 5 min**

**Title: Development and Mechanistic Interrogation of Catalyst Structures for Carbon Dioxide Conversion to Fuels**

**Abstract:** Metal oxide catalysts for CO<sub>2</sub> conversion usually comprise of nanocrystalline materials in which the catalytically active sites are few and often undetectable i.e., defect sites. Thus, these materials are not amenable to atomic level understanding of CO<sub>2</sub> conversion into useful chemical fuels as a strategy to decrease atmospheric CO<sub>2</sub> concentrations. This research presents approaches to solving this challenge including use of ionic liquids as electrolytes for new electrochemical routes to CO<sub>2</sub> conversion. Another study will highlight the use of atomic layer deposition techniques for the synthesis of atomically defined, few atom clusters of indium and cobalt oxides stabilized in either metal organic frameworks or polymers. These clusters resemble typical active sites in bulk metal oxides as well as molecular CO<sub>2</sub> conversion catalysts hence provide a platform to probe the relevant atomic and chemical state of the catalysts to develop structure-activity relationships.

**Bio:** Dr. Thabiso Kunene joined Hampton University in August 2023 as a Faculty member in the Chemistry and Biochemistry Department. Dr. Kunene received a Doctorate degree in Inorganic Chemistry from the University of Delaware working on mechanistic implications of CO<sub>2</sub> reduction driven by protic ionic liquids. He then completed postdoctoral training at Argonne National Laboratory working on vapor synthesis of atomically precise metal oxide clusters. At Hampton, his research interests primarily focus on rational design and synthesis of metal-oxo clusters with tunable electronic and geometric structures for energy conversion and storage.