Sustainable Conversion of Carbon Dioxide and Shale Gas to Green Acetic Acid via a Thermochemical Cyclic Redox Scheme
Sheraghani Iftikhar, Yunfei Gao, Qiongqiong Jiang, Xijun Wang, Luke Neal (Co-PI) and Fanxing Li (PI)
Department of Chemical & Biomolecular Engineering, North Carolina State University

**Project Objective**
To develop a process for sustainable and cost-effective production of acetic acid, a critical building block for the plastic industry, from carbon dioxide and domestic shale gas resources.

**Proposed Strategy**
To perform CO₂-splitting and methane partial oxidation (POx) in a synergistic two-step, thermochemical redox scheme via a hybrid redox process (HRP).

**Potential Benefits**
(i) Separate streams of methanol ready syngas and CO
(ii) "low temperature" redox catalyst system for waste heat utilization
(iii) Ability to produce other valuable chemicals, e.g., mono-ethylene glycol and acetic anhydride.

**Key to Success:** Effective redox catalyst particles

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**HRP Material Development**

**La-substituted Ceria**
Easier Oxygen Removal and Migration

**PGM-free Redox Catalyst**

**Redox Catalyst Optimization**
DFT Guided Redox Materials Optimization

**Techno-Economic Analysis**

**Comparison of Key Economic Indicators**
41% capital savings with HRP.
32% reduction in cost per tonne of acetic acid vs. reference cost.