

**PPDO-100**  
**Production of Fuel-Cell Grade Hydrogen by Thermal Swing Sorption Enhanced Reaction (TSSER) Concept**

**Shivaji Sircar**

Department of Chemical Engineering, Lehigh University

**Hugo S Caram**

Department of Chemical Engineering, Lehigh University

**Industry Participants**

Air Products and Chemicals, Inc.

**Abstract**

The ultimate objective of this proposal is to demonstrate the operation of a hydrogen generation system by steam reforming of CH<sub>4</sub> or propane and employing the TSSER concept. The initial work will be geared towards proof of concept and it will consist of:

- (a) Identification of the optimum CO<sub>2</sub> chemisorbent for the proposed process concept.
- (b) Generate the appropriate adsorptive characteristics (equilibrium, selectivity and kinetics of CO<sub>2</sub> adsorption) of the chemisorbent for the thermal swing adsorption mode of operation of the proposed idea.
- (c) Evaluate the optimum operating temperature bracket for the chemisorbent and test the thermal stability of the material under these cycling conditions.
- (d) Study the column dynamics of CO<sub>2</sub> ad(de)sorption processes on the material under various conditions with and without the presence of a commercial SMR catalyst
- (e) Actual steady state operation of the entire process concept using a single reactor bed and mimicking the individual process steps.
- (f) Successful demonstration of the concept will be complemented by the development of a process model for design and scale-up.