Low Regeneration Temperature Sorbent for Direct Air Capture of CO_2

DE-FE0031965

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Susteon Inc.

U.S. Department of Energy

National Energy Technology Laboratory

Direct Air Capture Kickoff Meeting

February 24-25, 2021

Program Overview

a. Funding: $999,687 *(DOE and Cost Share)*
b. Overall Project Performance Dates: 10/2020 – 03/2022
c. Project Participants:
    a. Susteon Inc. (Prime)
    b. University of Wyoming (Professor Maohong Fan)
    c. SoCalGas
d. Overall Project Objectives: Development of catalyzed solid sorbents with fast kinetics and low regeneration temperature for direct air capture of CO_2. The catalyst will reduce CAPEX and reduce energy consumption for sorbent regeneration resulting in lower cost of DAC.

Technology Background

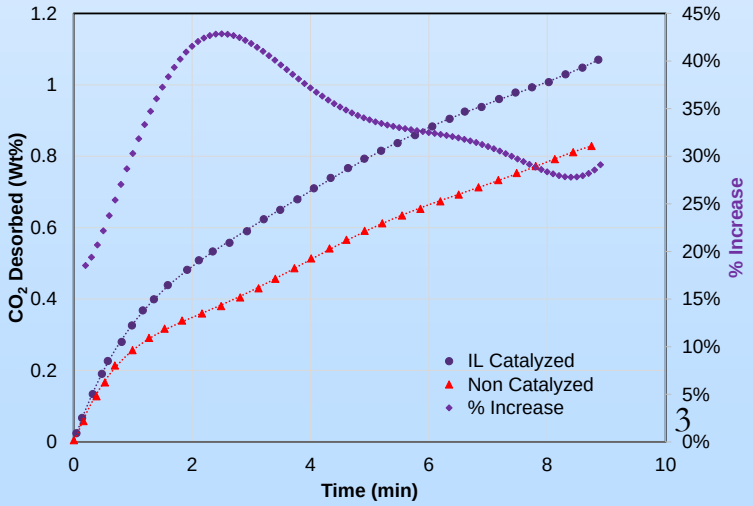
a. Catalyst has been used to improve CO_2 sorption and desorption rates by several orders of magnitudes amine solvent/sorbent based CO_2 capture applications.

b. Only ppm quantities of the catalyst need to be added to amine-based adsorbents. This has a potential to reduce the regeneration temperature to 80°C, thus lowering the overall cost of CO_2 capture.

   a. Lab-scale data on proprietary catalyst in MEA solution confirmed 30% increase in desorption rate and reduction in regeneration temperature

   b. TEA: Significant reduction in overall CO_2 capture cost

Metric	State-of-Art	Goal
CO_2 Adsorption Kinetics (gmol/min/kg)	1.0	2.0
Temperature of Regeneration (°C)	100-120	80-90
Energy of Regeneration (%)	100%	80%



Technical Approach/Project Scope

a. Planned Experimental and Process Modeling Work
   - Synthesis, characterization and testing of catalysts and sorbents
   - Measure rates of adsorption and desorption
   - Determine heat and mass transfer
   - Develop process model, process design with TEA

b. Project Schedule
   1. Initial Technology Maturation Plan (TMP) developed
   2. Catalyst and sorbent synthesis in progress

c. Project success criteria
   1. Development of a catalyst that can be added to amine doped DAC sorbents to increase adsorption and desorption kinetics
   2. An increase of at least 50% in adsorption and desorption rates as compared with un-catalyzed SOTA sorbents.

Team and Facilities

Susteon

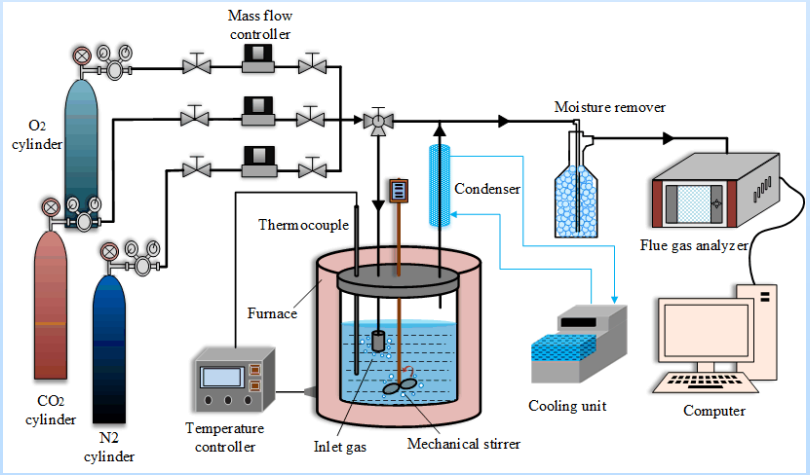
Raghubir Gupta
President

S. James Zhou
Senior Director

Cory Sanderson
Process Technologist

Jian Zheng
Sr. Engineer

UNIVERSITY OF WYOMING



Progress and Current Status of Project

- Preliminary TMP completed
- DAC process cost parameters analyzed
- Catalyst synthesis recipe defined
- Catalyst quality control procedures established
- Catalyst synthesis setup assembling in progress
- Sorbent testing setup assembly in progress
- Sorbent supports and amines screening in progress

Opportunities for Collaboration

a. In discussion with industrial partners about potential application of the catalyst in catalyzing CO_2 capture from natural gas, flue gas, and syngas streams.
b. Explore testing of catalyst with amines under realistic operating conditions

Susteon

University of Wyoming

SoCalGas
A Sempra Energy utility