An Efficient, Cost-Effective Approach to Industrial CO_2 Management

Challenges

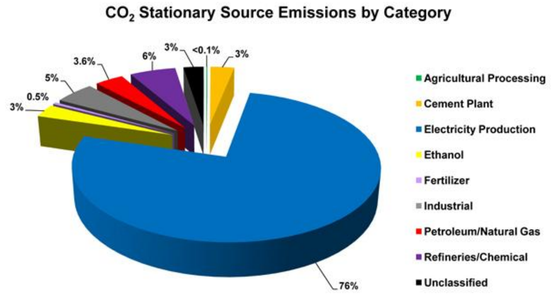
- Low cost CO_2 capture technology for industrial emitters

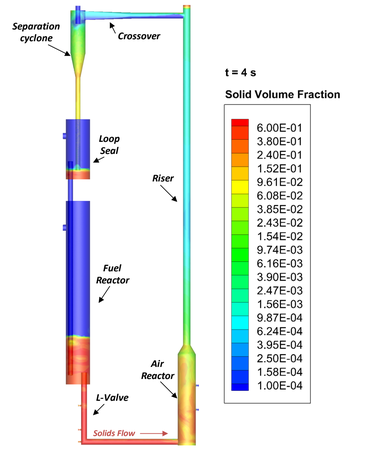
Technology/Capability Overview

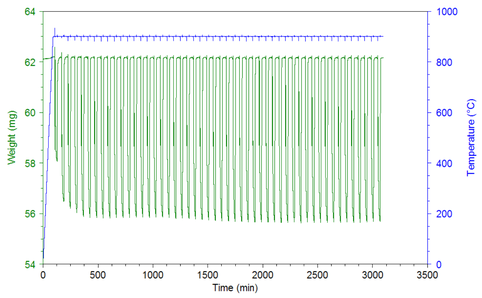
- The *Industrial Carbon Management Initiative (ICM* developing technologies and simulation tools for carbon capture, utilization, and storage from industrial sources
- Chemical looping is a promising approach for simultaneously generating heat and a concentrated CO_2 stream to facilitate carbon capture
- No capital costs are needed for an ASU (oxyfuel combustion), or amine scrubber (post-combustion capture)
- No need for change in process stream conditions needed to capture CO_2 (temperature/pressure swing, etc, as needed for pre- and post-combustion capture)
- Moisture will not adversely affect the process
- More robust to changes in process conditions than a membrane separation system

Industry Significance

- Chemical Looping uses a metal oxide to transport oxygen from the air to the fuel
- Separation of oxygen from the air produces a binary mixture of CO_2 and H_2O in the flue gas, similar to an oxy-fuel process.
- Combination of CFD simulation and experimental calibration allows physics-based extrapolation of plant performance
- Techno-economic studies conducted in parallel effort are used to focus research on high impact areas







Benefits to Partner

- Ultra-low NO_x emissions
- Inherent CO_2 separation due to the nature of the combustion process
  - Low Cost CO_2 made available for EOR/EGR applications
- Combustion technology can be tailored to meet fuel needs (coal vs natural gas)

Opportunity

- Looking for partner to demonstrate technology at larger scale
  - Boiler and/or
  - CO_2 reuse for EOR or EGR
- NETL can provide expertise
  - Oygen carrier development
  - Multiphase flow experiments and modeling

Development Status

- Patent Application filed (S-130,411) for doped Fe-based carriers.
- Combining CFD simulations with experimental data to accelerate technology development
- Built a 50kW Chemical Looping Reactor for detailed study of chemistry, particle attrition, and system hydrodynamics
- Developing a high temperature solids flow sensor to measure carrier circulation rates

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