

Carbon Capture 2020

Solid Adsorbents &
Absorbents

Introductions

Presenters	Holly Krutka
	John Kitchin
	Jeff Long

Facilitator	Charles Schmidt
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Attendees	Scott Chen	Steven Chuang	Daniel Fauth	Michael Janicke
	Mark Petersen	Thomas Nelson	Vidvuds Ozolins	Jordan Schmidt
	Peter McGrail	Ed Stephens	Yves Chabal	Robert Statnick

New Mechanisms for Releasing CO₂ from Solid Sorbents.

Technology Readiness	<ul style="list-style-type: none">■ Below Basic Science and Ideas
Technical Barriers	<ul style="list-style-type: none">■ Just Beginning■ How to Evaluate Systems
Research Areas	<ul style="list-style-type: none">■ Microwave Radiation■ Electrical■ Light■ Mechanical Pressure■ Conversion Within A Substrate■ Phase Change■ Kinetics■ pH Changes

Basic Science Engineered Solids— MOF's, ZIF's, etc.

Technology Readiness	<ul style="list-style-type: none">■ Basic Science & Ideas
Technical Barriers	<ul style="list-style-type: none">■ Target Binding Enthalpy of CO₂ and Contaminants.■ Improving Thermal Stability.■ Developing improved methods for functionalizing materials.■ Improved methods for measurement of gas uptake needed.
Research Areas	<ul style="list-style-type: none">■ Diffusivity and gas-host interaction Measurements.■ Computational Analysis■ Basic Synthetic Chemistry.■ Tribological properties.■ Measurements of gas-host interactions.■ Attrition.

System Engineering Sorbents –

Alkali Metals, Amine, Zeolites, Carbons, Silicas, etc.

Technology Readiness	<ul style="list-style-type: none">■ System Engineering and Integration
Technical Barriers	<ul style="list-style-type: none">■ Regeneration Energy Requirements.■ Attrition.■ Improve Heat Integration.■ Waste Disposal
Research Areas	<ul style="list-style-type: none">■ Full Process Analysis – (Water, Contaminants, Etc.)■ In-depth Development of ThermoPhysical Properties.■ Scale-up Sorbent Manufacturing Process.■ Measurements of gas-host interactions.■ Improve Solids Handling.

High-Temperature solid sorbents- Calcium

Technology Readiness	<ul style="list-style-type: none">■ Pilot Scale/ System Integration
Technical Barriers	<ul style="list-style-type: none">■ Integration into Powerplants. (Identifying most efficient process e.g. FBC, Transport Reactor, etc.)■ Improve Heat Integration.■ Waste Disposal.
Research Areas	<ul style="list-style-type: none">■ Computational Analysis.■ ThermoPhoresis.■ System Analysis.■ Measurements of gas-host interactions.

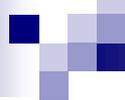
Viability Assessment of Solid Absorbents

Technical Barriers	<ul style="list-style-type: none">■ Need better understanding of Powerplant design and operating conditions.■ Measurements Recorded in labs do not correspond directly with Real World Conditions.■ Uncertainty in cost assessments and cost of producing sorbents due to lack of resource availability.
Research Areas	<ul style="list-style-type: none">■ Creating process design equations in terms of lab experiments.



Conclusions

- Further development of Carbon Capture technologies needs industry wide communication and collaboration on projects(Academia, DOE, Industry).
- Create a living document with basic targets and success criteria for Carbon Capture materials and processes.



US DoE Grand Challenge for the Next Generation of CO₂ Capture Materials and Processes

- Determine materials performance targets:
Thermodynamics, kinetics, capacity, requirements, cost, etc.
- Create a joint FE/BES program