

# TECHNOLOGY OPPORTUNITY

## REGENERABLE NON-AQUEOUS BASIC IMMOBILIZED AMINE SLURRIES FOR REMOVAL OF CARBON DIOXIDE (CO<sub>2</sub>) FROM A GASEOUS MIXTURE

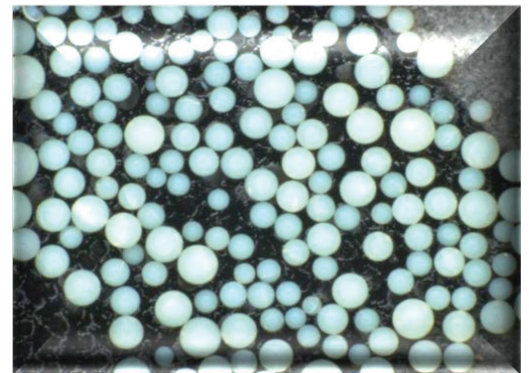
Separating CO<sub>2</sub> from a gaseous mixture, with a fluid containing polymerized silicone oil and a basic immobilized amine sorbent (BIAS)

### OPPORTUNITY:

The innovation represents a BIAS particle sorbent suspended in a non-aqueous fluid carrier (slurry) that is capable of CO<sub>2</sub> sorption, is easy to incorporate into established power plants, and can minimize energy and infrastructure requirements.

### CHALLENGE:

Carbon sequestration can reduce the emissions of CO<sub>2</sub> from large point sources and holds potential to provide deep reductions in greenhouse gas emissions. Amine-based solid sorbents are effective and economical agents for CO<sub>2</sub> capture from gaseous mixtures. However, because of the high concentration of CO<sub>2</sub> in many feed streams, a large quantity of the gas often reacts with the sorbent exothermically to produce excessive heat, which must be removed from the sorbent to prevent temperature instability within the reactor and to eliminate potential degradation of the sorbent. Reducing the damage to sorbents with this technology and method can increase efficiency and reduce replacement costs faced by industries.



### OVERVIEW:

NETL researchers have developed a technology and methods featuring a slurry comprised of BIAS sorbents suspended in a silicone oil. The method calls for the slurry to contact a gaseous mixture. The resulting CO<sub>2</sub> laden sorbent slurry removes the absorbed CO<sub>2</sub> from the laden sorbent slurry. The contact can occur via a scrubber operation, closed chamber, packed bed reactor, slurry bubble reactor, or stirred reactor.

### ADVANTAGES:

The conventional scrubbing system that is the comparative baseline for all other capture technologies is monoethanolamine (MEA) scrubbing. This wet scrubbing process removes CO<sub>2</sub> in an absorber then regenerates the spent scrubbing liquor in a vessel by indirectly heating the solution with plant steam. The process has several disadvantages including low CO<sub>2</sub> working capacity, corrosiveness to the equipment, susceptibility of MEA to poisoning, and most notably, a high energy requirement for CO<sub>2</sub> release from an aqueous solution. These disadvantages result in a costly CO<sub>2</sub> remediation technology. The NETL innovation increases process efficiencies and reduces overall costs.

(continued)



**FOR MORE INFORMATION:**

Customer Service:  
**1.800.553.7681**

626 Cochran's Mill Road  
P.O. Box 10940  
Pittsburgh, PA 15236-0940  
412.386.4687

3610 Collins Ferry Road  
P.O. Box 880  
Morgantown, WV 26507-0880  
304.285.4764

1450 Queen Avenue SW  
Albany, OR 97321-2198  
541.967.5892

**APPLICATIONS:**

Pulverized coal-fired-base steam cycles have been the predominant electric power generation technology and will continue to be used. Technologies for capturing CO<sub>2</sub> are needed for new and more efficient coal-fired facilities and will need to be retrofitted onto existing plants whether the capture occurs in combustion or gasification power generation systems from flue gas, or in other applications such as natural gas sweetening. The invention is targeted towards processes requiring large scale removal of CO<sub>2</sub> from gas streams at or near ambient pressure, having elevated CO<sub>2</sub> concentrations beyond atmospheric level, and temperatures between ambient and 100 °C, for example CO<sub>2</sub> capture from flue gas generated from coal or natural gas combustion in electrical power generation.

**RELATED PATENTS:**

U.S. Patent Pending (non-provisional patent application)

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Title: Regenerable Non-Aqueous Basic Immobilized Amine Slurries for Removal of CO<sub>2</sub> from a Gaseous Mixture and a Method of Use Thereof

Inventors: Fan Shi, McMahan Gray, Jeffrey Culp, Brian Kail, Christopher Mark Marin

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