TECHNOLOGY OPPORTUNITY

REGENERABLE NON-AQUEOUS BASIC IMMOBILIZED AMINE SLURRIES FOR REMOVAL OF CARBON DIOXIDE (CO_2) FROM A GASEOUS MIXTURE

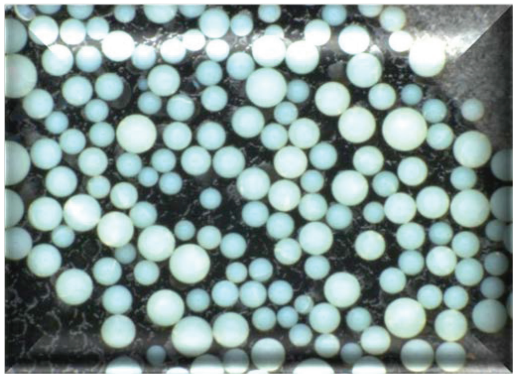
Separating CO_2 from a gaseous mixture, with a fluid containing polymerized silicone oil and a basic immobilized amine sorbent (BIAS)

OPPORTUNITY:

The innovation represents a BIAS particle sorbent suspended in a non-aqueous fluid carrier (slurry) that is capable of CO_2 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_2 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_2 capture from gaseous mixtures. However, because of the high concentration of CO_2 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_2 laden sorbent slurry removes the absorbed CO_2 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_2 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_2 working capacity, corrosiveness to the equipment, susceptibility of MEA to poisoning, and most notably, a high energy requirement for CO_2 release from an aqueous solution. These disadvantages result in a costly CO_2 remediation technology. The NETL innovation increases process efficiencies and reduces overall costs.

(continued)

www.NETL.DOE.gov

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_2 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_2 from gas streams at or near ambient pressure, having elevated CO_2 concentrations beyond atmospheric level, and temperatures between ambient and 100 °C, for example CO_2 capture from flue gas generated from coal or natural gas combustion in electrical power generation.

PATENT STATUS:

- U.S. Patent No. 16/110,352
  Issued 8/23/2018
  "Regenerable Non-Aqueous Basic Immobilized Amine Slurries for Removal of CO_2 from a Gaseous Mixture and a Method of Use Thereof"

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

  Ref No. 16N-02

NATIONAL ENERGY TECHNOLOGY LABORATORY

FOR MORE INFORMATION:

Jessica Lamp
Technology Transfer Program Manager
Jessica.Lamp@netl.doe.gov
412.386.7417

Customer Service:
1.800.553.7681

626 Cochrans 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