



# Solid Sorbents for Removal of Carbon Dioxide from Gas Streams at Low Temperatures

## Opportunity

The Department of Energy's National Energy Technology Laboratory is seeking licensing partners interested in implementing United States Patent Number 6,908,497 entitled "Solid Sorbents for Removal of Carbon Dioxide from Gas Streams at Low Temperatures."

Disclosed in this patent is a new low-cost carbon dioxide (CO<sub>2</sub>) sorbent that can be used in large-scale gas-solid processes. Researchers have developed a new method to prepare these sorbents by treating substrates with an amine and/or an ether in a way that either one comprises at least 50 weight percent of the sorbent. The sorbent captures compounds contained in gaseous fluids through chemisorptions and/or physisorption between layers of the substrate lattice. The polar amine liquids are located within these layers. This method eliminates the need for high surface area supports and provides absorption capabilities independent of the sorbent surface area, and can be regenerated.

## Overview

Although fossil fuels provide more than 98 percent of the world's energy requirements, their combustion results in a major source of the greenhouse gas CO<sub>2</sub>. The ability to efficiently and safely absorb CO<sub>2</sub> then becomes very important to the development and application of cost-effective technologies for the removal of CO<sub>2</sub> from gas streams. As a result, the U.S. Department of Energy has placed a high priority on research that reduces the high costs related to CO<sub>2</sub> separation and capture processes.

Currently used absorption processes, often referred to as wet chemical stripping, use aqueous amine solutions to facilitate the removal of CO<sub>2</sub> from gas streams in some industrial applications. However, CO<sub>2</sub> capture and sorbent regeneration using this method requires high temperatures and is therefore energy-intensive. Furthermore, the amine solution has a limited lifetime due to degradation through oxidation and subsequently causes corrosion problems. Although solid sorbents serve as alternatives to wet chemical stripping, they are limited by their respective surface areas. Since only the surface is involved in the reaction, a very limited quantity of reactive material can be incorporated in the solid sorbent.

This patented technology addresses the limitations of the previous absorbent process by producing a new sorbent with capabilities that depend on total volumes rather than just surface areas. In addition, the new sorbent can be easily regenerated at moderate temperatures (70-100 °C), and the material used to produce the sorbent is expected to be inexpensive. Furthermore, the new sorbent will eliminate corrosion and evaporation problems that plagued the previous sorption process.

## Significance

This sorbent invention has the following advantages:

- Provides greater absorption capability and breakthrough time
- Provides absorbent capabilities independent of surface area
- Requires less expensive materials to produce
- Avoids corrosion and evaporation problems
- Can be regenerated at low temperatures
- Presence of moisture has no effect on the CO<sub>2</sub> absorption performance
- Requires low regeneration energy due to low specific heat capacity of the substrate and low regeneration temperature

## Contact

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May 2011