



Method for Regeneration of Immobilized Amine Sorbents for Use in CO₂ Capture

Opportunity

Research is currently active on the patent-pending technology “Regenerable Sorbent Technique for Capturing CO₂ Using Immobilized Amine Sorbents.” The technology is available for licensing and/or further collaborative research from the U.S. Department of Energy’s National Energy Technology Laboratory.

Overview

Carbon sequestration entails a multi-step process in which anthropogenic CO₂ emissions are captured from CO₂-laden process gas streams and permanently stored. Carbon capture is a critical step in the process and accounts for a considerable portion of the overall cost. Newly developed, high-capacity amine-based sorbents offer many advantages over existing technology including: 1) increased CO₂ capture capacity; 2) reduced corrosion, energy requirements, and costs; and 3) minimized water usage. Additionally, amine-based sorbents are scalable for use in industrial applications, including coal combustion and gasification power generating systems.

The current advanced technology describes a steam regeneration process for amine-based solid sorbents used in CO₂ capture. This method reduces the impact of water loading on sorbent regeneration by using a conditioner after the steam regeneration step. The conditioner utilizes a drying gas, which contacts the regenerated sorbent to remove free steam, and it reduces the water loading of the regenerated sorbent by removing a portion of the adsorbed water present. The adsorbed water removed by the conditioner is equivalent to the water uptake expected during the subsequent CO₂ absorption process. This provides for water loadings on the sorbent exiting the absorber and entering the regenerator to be matched to the moisture loading of the sorbent exiting the regenerator under a sweep of steam, allowing the thermal energy transferred to the loaded sorbent to be utilized for CO₂ desorption rather than desorption of adsorbed water. The method allows for optimal CO₂ removal capacity for a given absorption and regeneration reactor size. Management of water loading in this manner allows optimal operation of the regeneration reactor with a significant reduction in energy losses incurred by the desorption of adsorbed water.

Patent Details

U.S. non-provisional patent application titled “Regenerable Sorbent Technique for Capturing CO₂ Using Immobilized Amine Sorbents” was filed on 3/21/11.

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Significance

- Reduces energy loss during sorbent regeneration
- Maximizes CO₂ removal capacity
- Accounts for and minimizes moisture in the overall sorbent process
- Minimizes the overall cost of CO₂ capture

Applications

- Combustion or gasification power generation systems using amine-based solid sorbents for CO₂ capture and natural gas cleanup.

Contact

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November 2011