Use of Sterically Hindered Amines for Hydrogen Sulfide Separations (#8197)

Severely sterically hindered amines are the best adsorbent to remove hydrogen sulfide in high and low carbon dioxide concentrations.

Inventors at Georgia Tech have reported the use of three silica supported sterically hindered amines, two moderately hindered amines (containing primary and secondary amine groups) and one severely hindered amine (containing a secondary amine group) for H₂S separations. Using a multi-component gas mixture of H₂S/CO₂/CH₄, a range of experiments confirm that moderately sterically hindered amines can simultaneously remove CO₂ and H₂S while the most severely sterically hindered amine, based on utilization of a unique grafted species, is the best adsorbent for the selective removal of H₂S in the presence of low and high CO₂ concentrations. In turn, the inventions offers facile regeneration or lower regeneration energies.

Benefits/Advantages

- **Lower-cost** - operating costs by lower regeneration energies yield lower production costs in comparison to existing practices
- **Efficient** - highest H₂S/CO₂ selectivity’s obtained using severely hindered amines to date

Potential Commercial Applications

- Natural gas treatment in downstream/upstream facilities for selective removal of H₂S from CO₂ and CH₄
- Meeting industry requirements for renewable natural gas production
- Sulfur recovery via Claus process

Background/Context for This Invention

Hydrogen sulfide, or H₂S, is a highly corrosive gas, commonly found in natural gas. The presence of H₂S in gas can cause corrosion in gas engines, turbines, and gas transmission lines. Consequently, H₂S has to be removed before the gas can be used as fuel or sent to the gas pipeline. Sterically hindered amines (SHA) in solution have been used for selective H₂S separations due to their selectivity in removing H₂S over CO₂. A disadvantage with these amine solutions is the necessity of high regeneration energies associated with aqueous systems.
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For more information about this technology, please visit:  
https://industry.gatech.edu/technology/use-sterically-hindered-amines-hydrogen-sulfide-separations