ADSORBENT FOR CO_2 CAPTURE AT AMBIENT CONDITIONS

INVENTION

The invention uses magnesium oxide (MgO), functionalized with 3-aminopropyl-triethoxysilane (APTES), as a solid adsorbent for CO_2 capture at ambient conditions (30°C, 1 bar).

MARKET NEED AND GROWTH

Removing CO_2 from natural gas is essential to meet industry specifications before the gas is delivered. CO_2 capture by amine based absorption consumes high energy for regeneration, liquid amines can leak and corrode process equipment and amines can degrade during regeneration. On other hand, membrane process faces fouling and high energy consumption issues.

Additionally, the biggest challenge with climate change is that 95% of the CO_2 is already in atmosphere. Direct air capture (DAC) technology is receiving attention to remove billions of tonnes of CO_2 per year directly from the atmosphere.

Solid adsorbents which are effective at ambient conditions, fully regenerable with minimal regeneration energy and thus lowering the costs are needed.

The global Carbon Capture, Utilization and Storage (CCUS) technologies market is projected to reach $3.4 billion by 2025. North America has the biggest share in the global market.[1]

APPLICATION

- Direct Air Capture (DAC)
- Removing CO_2 from natural gas

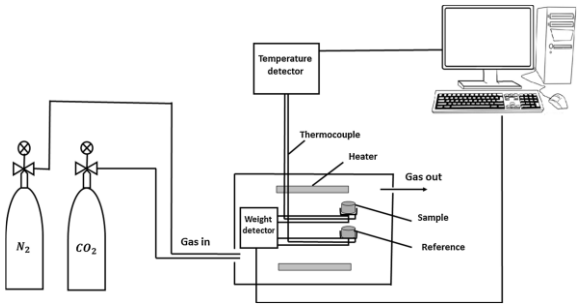
ADVANTAGES

- Unlike amine solutions, the solid adsorbent would not leak and harm environment
- The adsorbent is effective at ambient conditions
- Adsorbent is stable and fully regenerable using minimal energy

[1] Carbon Capture, Utilization & Storage Technologies, Dec 2020, BCC Research

PROJECT STATUS

- APTES-MgO-A solid adsorbent was synthesized in lab
- Thermogravimetric analysis and pure CO_2 gas was used to measure CO_2 uptake capacity of the adsorbent. Upon reaching equilibrium in 90 mins, a capacity of 66 mg/g (1.65 mmol g^{-1}) was achieved
- The regenerability of the adsorbent was evaluated by conducting six consecutive adsorption-regeneration cycles. The adsorbent was fully regenerated within 20 mins of contact with N_2 gas stream at 120 °C.



Schematic of Setup for CO2 Adsorption Evaluation

LOOKING FOR DEVELOPMENT PARTNER

We are looking for:

- industry input on current requirements for a novel adsorbent and feedback on additional R&D needed to evaluate the adsorbent for desired commercial applications
- a company who can collaborate on the R&D, evaluation and scale-up the technology for commercialization by licensing the intellectual property (IP)

PATENT PROTECTION

A U.S. patent application 16/797786 covers composition of the adsorbent, method of making it and method of using the adsorbent for capturing CO_2. The IP is owned by King Fahd University of Petroleum & Minerals (KFUPM).

ABOUT KFUPM

KFUPM is located in Saudi Arabia and currently ranks at 163 in QS World University Rankings 2022.

For further information please contact
IP-License@kfupm.edu.sa