Skysong Innovations
Advancing the Arizona State University Knowledge Enterprise

1475 N. Scottsdale Road, Suite 200
Scottsdale, AZ 85287-3538
Phone: 480 884 1996 Fax: 480 884 1984

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Inventors

Klaus Lackner

Contact

Shen Yan
shen.yan@skysonginnovations.com

A Dual Hollow Fiber Structure for Moisture Driven Continuous Carbon Dioxide Capture

-Background

The extraction of carbon dioxide (CO2) from the air is one of the few processes able to recover excess carbon from the environment. Regulatory frameworks already support negative carbon emissions, and this support has continued to increase in recent years. There are many possible uses for CO2 taken directly from air, including industrial building materials, fertilizer, and plastics. There is a growing need to develop CO2 capture technologies that are efficient and low-cost.

Invention Description

Researchers at Arizona State University have developed a novel device that increases the concentration of captured CO2 from air using moisture pump hollow fibers. This device uses the hollow fibers to pass a moist sweep gas through the interior of the fiber in order to enrich CO2 on the inside of the fiber to higher concentrations.

This device has two hollow fibers, one of which is inside the other. The inner fiber has a hydrophobic porous membrane through which liquid water is delivered. The outer fiber is made of active pumping material and is sturdy enough that it can be evacuated without collapsing. During the capture process, water evaporation from the inner fiber will maintain water saturation on the outside, which pulls CO2 from the ambient outside air into the inner fiber. Slow flowing gas collects the mixture of water vapor and CO2 at the end of the hollow fiber.

Potential Applications

- Building materials (e.g., plasterboard, cement, bricks)
- Plastic production
- Synthetic fuels
- Agriculture (e.g., fertilizer)

Benefits & Advantages

- CO2 transferred and collected within a confined membrane
- Less equipment required than current CO2 capture devices
- Lower overall energy expenditure
- Less expensive to operate

Related Publication: Moisture-swing sorption for carbon dioxide capture from ambient air: a thermodynamic analysis