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Carbon Dioxide Sorbents and Structures

Carbon dioxide (CO₂) sequestration has had significant technological advances in recent years. Unfortunately, these methods are ineffective when the CO₂ concentration is extremely low (i.e. air- capture technology). The use of humidity or moisture swing sorbents offers a distinctly different path to extracting CO₂ from air. Moisture swing sorbents bind CO₂ when relatively dry and release them again when exposed to increased levels of moisture either in the form of liquid water or water vapor. CO₂ affinity can be substantially modified by the presence or absence of water. All well studied sorbents are relatively brittle, glass-like materials that swell significantly when exposed to moisture. The strains associated with swelling have so far made it impossible to create large structures from homogenous sorbent material. This has prevented, for example, extruding simple monoliths or long thin strands of pure sorbent materials. Thus, there is a need for a durable moisture swing structure which is better equipped to deal with swelling.

Researchers at Arizona State University have invented methods and systems for producing carbon dioxide (CO₂) sorbents and structures. The invention includes three unique structures. The first consists of paper composites with sorbent powders attached to the paper structure. The second are Tyvek® composites including highly hydrophobic but porous sheets that protect resin powders from direct contact with water. The third method utilizes activated carbon with carbonate ions embedded into the carbon structures. All three of these methods work effectively if the CO₂ concentration is very low. Larger moisture swings can be built without problematic swelling.

Potential Applications

- CO₂ capture/sequestration
- Composite materials
- Air filters
- Separation of a low-concentration gas from a mixture

Benefits and Advantages

- Versatility –
 - The barrier can protect the sorbent from direct contact with salt water without stopping the exposure to moisture, reducing the previously inhibitory dependence on fresh water.
 - Three distinct methods and systems are discussed.
- Green Technology – advances in CO₂ capture to allow for better environmental remediation.

For more information about the inventor(s) and their research, please see

[Dr. Allen wright's directory webpage](#)

[Dr. Klaus Lackner's directory webpage](#)