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Case ID:M21-022P
Published: 2/2/2022

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Electrospun K2CO3/Activated-Carbon Composites for Carbon Dioxide Capture

-Background Direct air capture (DAC) is a process of capturing carbon dioxide (CO2) directly from air. The CO2 can be captured when the air contacts a chemical medium or functionalized sorbent, and then removed from the chemical medium or functionalized sorbent to yield a CO2 stream. Invention Description Researchers at Arizona State University have developed electrospun nanofiber composites, in the form of membranes or mats, for DAC of CO2. The nanofiber composites include potassium carbonate–infused activated carbon (K2CO3-AC) embedded in polymer nanofiber membrane composites. The K2CO3-AC serves as sorption sites for CO2. To disperse the activated carbon (AC) throughout the composite, the process of electrospinning is used. As a result, the membranes or mats feature uneven surfaces that develop turbulence, and combined with a tunable, high surface-area-to-volume ratio, enable fast sorption kinetics. The AC content promotes high CO2 loading capacity into the membranes or mats without sacrificing flexibility or robustness. Potential Applications • Carbon dioxide sequestration • Direct air capture systems Benefits and Advantages • Scalable, single-step process • High surface area of sorption and fast kinetics for CO2 capture • Resulting membranes are flexible and robust • Can be used in thermal swing CO2 capture technologies • Compatible with electro-spraying of K2CO3-AC for enhanced loading and kinetics • Fiber morphology (and thus composite properties) can be controlled by varying electrospinning conditions • Water-soluble polymers such as poly(vinyl alcohol) (PVA) and polyethylene oxide (PEO) can be used to make the process eco-friendly

Research Homepage of Professor Matthew Green

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