SORBENTS FOR CARBON CAPTURE

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Solid sorbents offer the potential for lower regeneration energy, lower corrosion, and lower emissions than solvent-based systems. These advantages enable their use for removing CO_2 at low concentrations in spacecraft and from air prior to cryogenic oxygen separation. Several sorbent classes offer promise for economic CO_2 capture in large-scale power plant applications. These classes include: zeolites, silica gels, activated carbons, metal organic frameworks and supported amine sorbents.

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NETL implements this effort as part of DOE's Clean Coal and Carbon Management Program.

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Sorbent-based CO_2 capture research area within the Carbon Capture Research Portfolio is influencing the discovery of a new generation of sorbents with properties that exhibit improved performance, low-cost, and ease of scale-up in combination with high CO_2 working capacity, high stability, low-pressure drop, and improved heat management. The development of these revolutionary materials guided by advanced computational modeling, process optimization and advanced design will address challenges and pursue potential benefits within and across each of the following three primary platforms:

ADVANCED SORBENT MATERIALS — Expert material scientists, chemists and engineers are using advanced simulation techniques to evaluate thousands of potential sorbent materials. Ideal materials will demonstrate the ability to be manufactured at large scales and enable optimal, stable, low-cost and high-capacity operation.

ADVANCED PROCESS MODELING AND EXPERIMENTATION — Investigations are focused on innovative and radical improvement to current solid sorbent processes (e.g., moving bed, fluidized bed, pressure swing absorption and novel fixed sorbents) with a focus on the creation of advanced solid-gas contacting designs and the development of reactors with less pressure drop, lower attrition rates and better heat management.

ENABLING TECHNOLOGY DEVELOPMENT — Research in this area is identifying and examining a full range of novel approaches to control heat transfer issues, reduce pressure drop, and enhance long-term sorbent reactivity and recyclability.

The vision for this program is to develop a 21st century America that can take advantage of our nation's abundant, sustainable fossil resources while reducing atmospheric CO_2 emissions.

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