UT Engineering New Research Grant Award

Dr. Lipscomb

Project	Low-pressure Membrane Contactors for CO_2 Capture
Investigators	**Dr. Glenn Lipscomb** Professor of Chemical Engineering
Sponsor(s)	U.S. Department of Energy
Project Duration	January 2012 – December 2014
Sponsor Award Amount	$289,304

PROJECT SUMMARY

The release of carbon dioxide from the combustion of fossil fuels is of great concern due to the potential for global warming. Projected temperature increases vary from 1 to 4 °C by 2100 given projected global rates of carbon dioxide release. The climate changes that would accompany such a temperature increase pose tremendous challenges to maintaining biodiversity and the quality of life that we currently enjoy.

To mitigate carbon dioxide release and global warming, the U.S. Department of Energy is evaluating a number of technologies for carbon dioxide capture and ultimate sequestration. Capture technologies often are classified by whether the technology involves a pre-combustion processing step or a post-combustion processing step. Pre-combustion technologies typically involve production of an oxygen enriched gas to feed to the combustion furnace while post-combustion technologies rely on selectively removing carbon dioxide from the flue gas that leaves the furnace. Post-combustions technologies under consideration include liquid absorption, solid adsorption, and membrane gas separation.

In collaboration with Membrane Technology and Research Inc., the lead organization on the $3 million DOE proposal, the proposed work is to design, build, and operate a 500 m^2 prototype low-pressure, counter-flow, sweep membrane module for use in post-combustion carbon dioxide capture. The University of Toledo (UT) will lead efforts to simulate and design these large modules. Of particular concern is the pressure drop through the module and the degree to which counter-current flow is achieved. The need to sweep the carbon dioxide out of the module significantly complicates module design.

The UT team will use a combination of computational fluid dynamics (CFD) and computed tomography (CT) to evaluate design parameters. CFD simulations will be used to evaluate the uniformity of flows, pressure drops, degree of counter-current flow, and carbon dioxide mass transfer within modules. CT will be used to directly visualize flows and mass transfer within prototype modules to validate the CFD results and identify sources of inefficiency.

The results of the proposed work will lead to the development of large scale membrane-based carbon dioxide capture processes to mitigate the effects of global warming. This will the first large-scale modules developed for this purpose.

NGN: September 28, 2011

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