The First Cost-Effective Solution for CO2 Capture

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U.S. DEPARTMENT OF ENERGY

Sandia National Laboratories

Sandia National Laboratories and the University of New Mexico is developing an ultra-thin, enzymatically active membrane that combines high CO2 permeability, high CO2 selectivity, and low fabrication costs, resulting in the first cost-effective technology for CO2 separation and purification.

If the membrane were embedded in a large-scale format, a savings of 62% in the cost of electricity generated by coal-fired power plants is projected relative to conventional technology. The new technology is forecast to save the U.S. coal industry alone $90B/yr for electricity generation compared with best-in-class CO2 capture technology.

The membrane is also highly adaptable. It can be optimized for fast, selective transport of other chemical species by embedding different enzymes. An example is methane mono-oxygenase, which converts methane gas to the more soluble methanol.

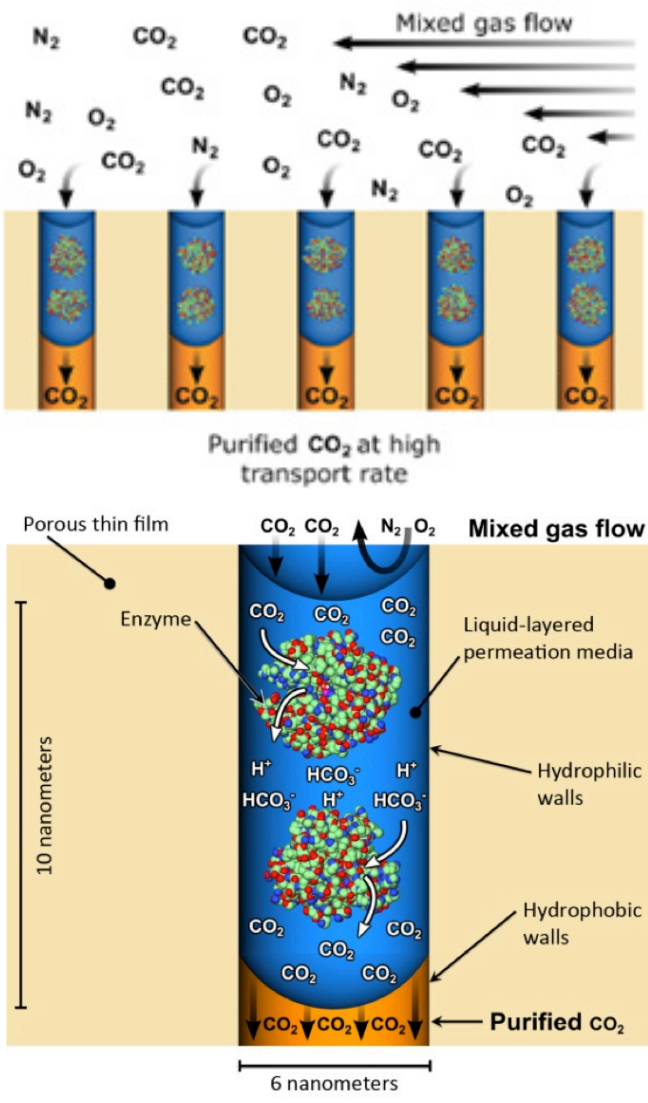
Out-Performs Competition

When compared with the nearest membrane competitor in pilot tests, the Sandia-UNM technology delivers a 3x faster permeation rate, 20x higher selectivity, and 7x lower fabrication cost. The fabrication process utilizes molecular self-assembly, atomic layer deposition, and plasma processing, which can be inexpensively scaled up.

The robust and inexpensive enzyme is already used at industrial scales. Confinement of the enzyme-loaded liquid layer in a nanopore results in a more stable enzyme structure that tolerates industrial operating conditions and facilitates fast CO2 transport by a new mechanism. The membrane is ultra-thin – 10-100 times thinner than conventional membranes, yet robust.

Industrial Partners

The Sandia-UNM team seeks funding from an industrial partner to scale-up the technology for CO2 capture from power-plant flue gas and other commercial applications.



Schematics of the nano-stabilized enzymatic membrane's active layer.

For more information visit:
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