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GTI ENERGY

solutions that transform

LOW-COST CO_2 CAPTURE

FACILITATED TRANSPORT MEMBRANE TECHNOLOGY

GTI Energy is a leading technology development organization. Our trusted team works to scale impactful solutions that shape energy transitions by leveraging gases, liquids, infrastructure, and efficiency. We embrace systems thinking, innovation, and collaboration to develop, scale, and deploy the technologies needed for low-carbon, low-cost energy systems.

FACILITATED TRANSPORT MEMBRANE

Low Cost CO_2 Capture with FTM Technology

GTI Energy and The Ohio State University (Ohio State) are developing a CO_2 capture process based on novel, transformational membrane technology coming out of OSU. Capturing CO_2 from power production and industrial gas streams, such as in cement and steel production, is key to reducing greenhouse gas emissions and plays an integral role in the transition to an sustainable and affordable energy system. Membrane systems are attractive in these applications because they are well proven in industrial gas separation applications, inherently modular in nature, and avoid operational and environmental challenges that are associated with more conventional, solvent based CO_2 capture.

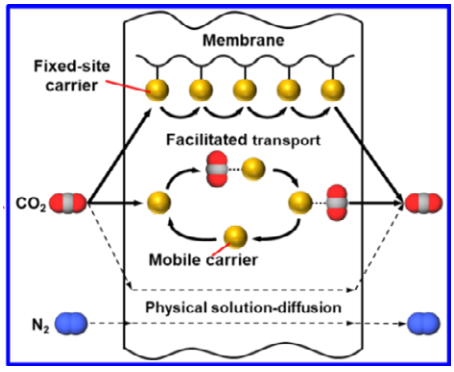
Based on a facilitated transport mechanism, the Ohio State membrane shows unprecedented flux and selectivity for CO_2. This greatly reduces the membrane area needed, resulting in lower CapEx and OpEx for the CO_2 separation from flue gas and other industrial gas streams. CO_2 capture costs of around $35 / tonne of CO_2 captured are achievable.

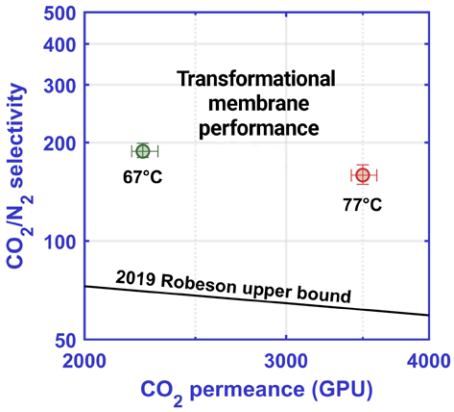
Under funding from the U.S. Department of Energy, excellent stability and high performance of the transformational membrane have been validated in controlled lab experiments and under actual power plant flue gas conditions in extensive tests at the National Carbon Capture Center (Alabama). The membranes can be operated without the need for flue gas cooling, whereas most conventional membranes require cooling flue gas to 25–30°C to achieve a useful selectivity. The Ohio State membranes are fabricated effectively and efficiently with a continuous roll-to-roll manufacturing process onto low-cost nanoporous polymer supports. The simplicity of the membrane structure and fabrication procedure offers a low cost for the membrane elements in a commercial spiral-wound configuration.

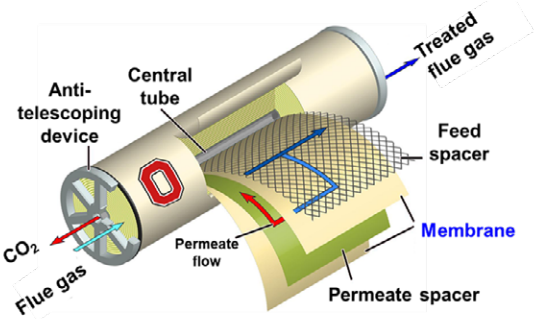
Photo courtesy ITC.

STATUS: In a $21 million project, largely funded by the U.S. Department of Energy, GTI Energy and Ohio State are fabricating facilitated transport membranes (FTM) and membrane modules, designing and building an engineering-scale CO_2 capture system with 20-tonne per day of CO_2 capture, conducting extensive tests on actual power plant flue gas at the Wyoming Integrated Test Center (ITC), and gathering data for further process scale-up.

GTI Energy will also partner with Ohio State to design and build a 3-tonne CO_2 per day engineering-scale test skid for testing at a Holcim U. S. cement plant in Holly Hill, South Carolina.







Graphics courtesy of Ohio State University

Key Features

- Amine embedded membrane ("facilitated transport") with high flux and selectivity
- Robust membrane structure in a commercial spiral-wound configuration

Applications

- Carbon capture from power plant flue gas
- Industrial carbon capture (e.g., cement and steel production, industrial boilers)

Benefits

- Smaller scale and lower capital and operating cost, resulting in low CO_2 capture cost.
- Modular system with layout and scale flexibility

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