

Biogas Enriching CO₂/CH₄ Separation Membranes

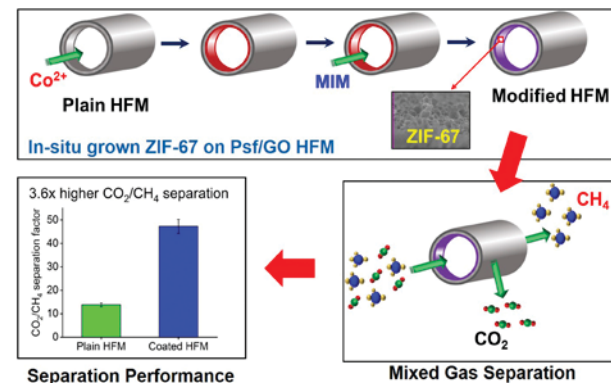
Problem Statement: As the demand for fossil fuels rises and its prices fluctuate, governments worldwide are exploring other alternatives, notably renewable energy sources. Thus, there is a need to identify and apply renewable energy sources for vehicles and domestic fuel; the potential of biogas can be tapped by removing the contaminant, CO₂. The government of India has come up with a scheme, “Sustainable Alternative Towards Affordable Transportation (SATAT)”, which is an initiative aimed at setting up Compressed Bio-Gas production plants and making them available in the market for use in automotive fuels by inviting expression of interest from potential entrepreneurs. Recognising this need, researchers at IIT Bombay have devised a product to meet this need for enriching biogas by CO₂.

Uniqueness of the Solution: The properties of membranes and zeolitic imidazolate frameworks-67 (ZIF-67) are combined to affect the CO₂ and CH₄

separation. Here, hollow fibre membranes of polysulfone coated with ZIF-67 nanoparticles showed a mixed gas (with 50:50 mol% feed gas) CO₂/CH₄ selectivity of 44.94 ± 3.00 , and CO₂ permeance of 39.25 ± 2.30 GPU was achieved. These results were obtained at 1 bar total pressure of feed gas.

Current Status of Technology: The experiments were conducted using 14 cm length of single fibres. The novel in-situ grown ZIF-67 on Psf/GO HFMs showed improved CO₂/CH₄ separation performance, making these modified membranes potentially useful for practical gas separation applications. However, further experiments need to be carried out for a higher flow rate of feed and a large number of fibres in a module. The research has been published in a peer-reviewed journal.

Societal Impact: Biogas can be used as fuel for vehicles and domestic purposes. Biogas contains carbon dioxide, which



does not burn, in addition to the primary fuel gas methane, and carbon monoxide. Purifying biogas by removing carbon dioxide improves biogas efficiency. This technology can help society by reducing fuel costs.

Patent(s): Nil

Relevant Industries: Clean Energy, Materials, Biogas Upgrading Industries.

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