

An Indian-Australian research partnership

Novel polymer composite membranes for the direct methanol fuel cell

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Research Academy theme/s

1. Clean Energy
2. Nanotechnology

The research problem

Existing membranes for the direct methanol fuel cell (DMFC) are usually perfluorinated hydrocarbon membranes with fixed charge groups to facilitate ionic transfer. These membranes however suffer from methanol crossover from the anode to the cathode, and are expensive.

Project aims

This project aims to develop a new class of membrane for the DMFC, using readily available polymer substrates such as polysulfone (PSU), which has good chemical stability, and imparting high ion exchange capacity by incorporating functionalised inorganic nanoparticles.

Expected outcomes

The expected outcomes from this project is the design, synthesis and characterisation of a suite of nanocomposite polymer-inorganic membranes with tailored ion exchange and methanol diffusivity. These will be evaluated for the potential use in the direct methanol fuel cell, and the most promising materials will be formed into membrane electrode assemblies and tested in fuel cell tests.

Which of the above Theme does this project address?

The project addresses the two themes of Clean Energy and Nanotechnology.

How will the project address the Goals of the above Themes?

The project will result in the development of new membrane materials that will alleviate some of the bottlenecks in the development and commercialisation of DMFC technology. This will result in new technologies, taking advantage of the advanced membrane materials, being introduced to the market. Furthermore, the fundamental materials insights gained during the research may be applied to other fields, such as desalination or hydrogen production which utilise similar membrane materials.