

A Revolutionary Fuel Cell

Krishna N K Kowlgi, Ger J M Koper

DelftChemTech, Faculty of Applied Sciences, Delft University of Technology, Delft, The Netherlands

Abstract

To combat problems with performance consistency and manufacturing costs of Proton Exchange Membrane Fuel Cells (PEMFCs) a new design has been envisaged that is built entirely out of spontaneously self-assembling components (molecules) leading to a controlled structure of the cells at the nano-scale, guaranteeing highly tuneable properties and independence from current material suppliers.

Assembly starts by forming a bi-continuous micro-emulsion of amphiphilic fluorocarbon monomers in which carbon supported platinum nano-particles are synthesised in-situ. The monomers are later polymerised to form a rigid framework. The choice of platinum is because of its high electrochemical catalytic activity and a carbon support is required to ensure conduction of electrons. The bi-continuous network promotes fast transport of protons through its interconnected water channels and the fluorinated polymer backbone is essential to form a chemically and mechanically robust structure.

Studies with electrodes formed out of self assembled bi-continuous micro emulsions in which supported platinum catalyst nano-particles are synthesised in situ have shown positive results.