Quasi-anhydrous and dry membranes for next generation fuel cells

From 2010-12-01 to 2013-11-30, closed project

Objective

The European Strategic Energy Technology (SET) Plan has identified fuel cells and hydrogen among the technologies needed for Europe to achieve the targets for 2020 - 20% reduction in greenhouse gas emissions; 20% share of renewable energy sources in the energy mix; and 20% reduction in primary energy use – as well as to achieve the long-term vision for 2050 towards decarbonisation. The objective of QuasiDry is to develop innovative fuel cell electrolyte membranes for the next generation of fuel cells, satisfying the long-term automotive targets for cell temperatures at ca. 120 °C. Recent work in the partner laboratories convincingly demonstrates that phosphonic acid functionalised polymers are a viable alternative to sulfonic acids for high temperature operation. Their potential as membrane materials having high proton conductivity that demonstrates little variation with temperature and relative humidity will be shown in the QuasiDry project, and they will be validated by integrating them into membrane electrode assemblies with properties appropriate to automotive fuel cell operation. The increase of proton conductivity with temperature, including at low relative humidity, will allow continuous increase in fuel cell performance with temperature, rather than the drop in performance for all sulfonic acid functionalised membranes above ca. 80-90 °C. Catalysts adapted to phosphonic protogenic functions and high temperature operation will be developed. QuasiDry membranes will be validated within the project by elaboration of electrodes and membrane electrode assemblies, to the scale of small-scale (50 cm2) single cell demonstrators. The end result will be a step-change in the properties of the materials, as is required to underpin the future of European fuel cell research. Such long-term innovation is beyond the scope of the Joint Technology Initiative on Fuel Cells and Hydrogen and yet corresponds fully to the FET remit for future emerging technologies for energy applications.

Related information

Report Summaries

Final Report Summary - QUASIDRY (Quasi-anhydrous and dry membranes for next generation fuel cells)
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