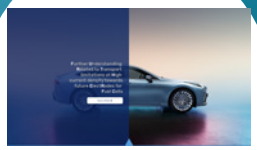
FURTHER-FC

FURTHER UNDERSTANDING RELATED TO TRANSPORT LIMITATIONS AT HIGH CURRENT DENSITY TOWARDS FUTURE ELECTRODES FOR FUEL CELLS



Project ID	875025
PRR 2024	Pillar 3 – H_2 end uses: transport
Call topic	FCH-01-4-2019: Towards a better understanding of charge, mass and heat transports in new generation PEMFC MEA for automotive applications
Project total costs	EUR 2 735 031.25
FCH JU max. contribution	EUR 2 199 567.35
Project start - end	1.1.2020–31.8.2024
Coordinator	Commissariat à l'Énergie Atomique et aux Énergies Alternatives, France
Beneficiaries	Centre national de la recherche scientifique; Chemours France SAS; Deutsches Zentrum für Luft- und Raumfahrt EV; École nationale supérieure de chimie de Montpellier; Hochschule Esslingen; Imperial College of Science, Technology and Medicine; Institut national polytechnique de Toulouse; Paul Scherrer Institut; The Chemours Company FC, LLC; Toyota Motor Europe NV; Université de Montpellier; University of Calgary

https://further-fc.eu/

PROJECT AND GENERAL OBJECTIVES

Further-FC proposes platforms coupling experimental study and modelling to better understand the performance limitations of the cathode catalyst layers (CCLs) of low-Pt-loaded proton-exchange membrane fuel cells. Based on this, CCL improvements will be discussed and tested. Up-to-date references and some customised membrane electrode assemblies (with different ionomer-to-carbon ratios, thicknesses, etc.) have been produced, models of the CCLs are progressing based on their structural characterisation and the first effective properties have been derived.

NON-QUANTITATIVE OBJECTIVES

- Better understand the performance limitations of proton-exchange membrane fuel cells.
- Set up numerical and modelling tools to do so, focusing on the cathode catalyst layer.

PROGRESS AND MAIN ACHIEVEMENTS

- Progress has been made in the characterisation of the CCLs (through atomic force microscopy, Raman spectroscopy, 3D focused ion beam scanning electron microscopy, etc.).
- Progress has been made in the modelling of CCLs at different scales.
- The definition and validation of test protocols enables reliable comparison between the partners.
- Various customised membrane electrode assemblies have been manufactured, tested and characterised (through cyclic voltammetry, linear sweep voltammetry, electrochemical impedance spectroscopy, life cycle assessment, etc.).

FUTURE STEPS AND PLANS

- The finalisation of the characterisations of reference and customised membrane electrode assemblies is ongoing.
- The finalisation of the modelling of the CCLs at different scales is ongoing.
- The determination of the most performance-limiting mechanisms is ongoing.
- The upscaling of the models has started.
- The combined analysis of experiments and modelling to explain the role of different ionomers and/or catalyst supports on performance is ongoing.

PROJECT TARGETS

Target source	Parameter	Unit	Target	Target achieved?	SOA result achieved to date (by others)	Year for reported-SOA result
MAWP (2014–2020)	Volumetric power density	kW/l	9.3		4.1	2017 (Auto-Stack CORE project)
	Weight power density	kW/kg	4		3.4	
	Surface power density	W/cm²	1.8		1.13	
	Cost	€/kW	20	⚙	36.8	
	Durability	hours	6 000		3 500	
	Total Pt load	mg/cm²	0.144		0.4	
		g/kW	0.08		0.35	
	Pt efficiency	A/mg	15		4.5	

Clean Hydrogen Partnership
Co-funded by the European Union