## AGENDA

**FURTHER-FC Workshop Agenda** 

General Talks

Ludwig Jörissen

Laurent Antoni

Thor Aarhaug

Joël Pauchet

Arnaud Morin

Stephane Cotte

Kunal Karan

Laure Guetaz

Pierre Boillat

Jens Mitzel

Coffee Break

Tobias Morawietz

Anthony Kucernak

Michael Eikerling

Thomas Jahnke

Andrew Park

Joël Pauchet

Arnaud Morin

Joël Pauchet

Jens Mitze

(tbc)

Introduction of Project Partners

Lunch break

Scientific highlights from FURTHER-FC

DLR

ZSW

CEA

CEA

Europe

Calgary

CEA

UES

ICL

PSI

DLR

DLR

CEA

CEA

DLR

**RWTH Aachen** 

Chemours US

Research

Hydrogen Europe

SINTEF Industry

Toyota Motor

University of

Welcome and Introduction to the Jens Mitzel

08:45

09:15

09:30

10:00

10:30

10:50

11:20

11:40

12:00

13:00

13:20

13:40

14:00

14:20

14:40

15:00

15:30

16:00

16:20

16:45

17:00

Welcome Coffee

General challenges in PEMFC

Overview of CAMELOT

Industry Point of View

**Ionomer Thin Films** 

the materials

in MEA

Cathodes

**Closing Remarks** 

DLR Lab Tour

Characterization of the CCL

local transport properties

Electrochemical modelling

Multiscale Modelling

structure - spatial distribution of

Characterisation of CCL materials

Quantification of local conditions

Electrochemical characterization

High Oxygen Permeable lonomers

for Durable, High Power Density

Discussion with the audience

**Overview of FURTHER-FC** 

Importance of strategic research

Importance of the Project from

workshop

challenges

Main Progress

<b>CONTACT AND</b>
REGISTRATION

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## **Registration**

dlr.expert/further-fc More information

further-fc.eu

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## FURTHER-FC Workshop July 6, 2022 DLR Stuttgart, Germany

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

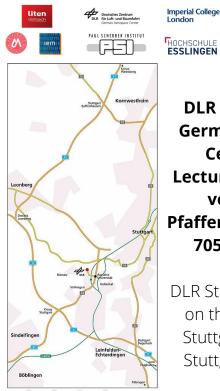


Face to Face meeting / online Free of charge



## PARTNERS

FURTHER-FC will benefit from the active role of renowned partners gathering significant experience on membrane electrode assembly manufacturing and testing [Toyota Europe (TME), French Alternative Energies and Atomic Energy Commission (CEA), German Aersospace Center (DLR)], state-of-the Art experimental techniques [CEA, DLR, Paul Scherrer Institut (PSI), University of Montpellier (IEM), Univ. of Applied Sciences Esslingen (UES), Imperial College London (ICL)] and modelling tools [CEA, DLR, National Polytechnic Institute of Toulouse (INPT)] supported by international entities [The Chemours Company (CC), University of Calgary(UCA)].



DLR site Stuttgart German Aerospace Center (DLR) Lecture Haal "Gräfin von Linden" Pfaffenwaldring 38-40 70569 Stuttgart

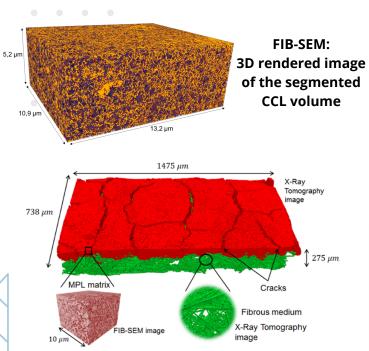
ΤΟΥΟΤΑ

Chemours<sup>-</sup>

DLR Stuttgart is located on the University of Stuttgart Campus at Stuttgart-Vaihingen.

# RESULTS 3D rendered image showing the interior (blue) and exterior (yellow) Pt NPs

AFM: 3D height-image with superposed stiffness values

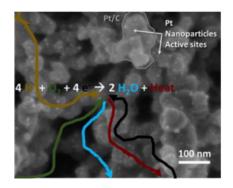


3D digital image of gas diffusion layer combining Xray Tomography (fibrous medium, cracks) and FIB-SEM (MPL matrix)

## AMBITION

FURTHER-FC will bring new knowledge on the catalyst coated layer (CCL):

- Microstructure
- Correlation between transport properties, performance and components (Platinum, Carbon, lonomer) and their structure
- local conditions during operation
- limitations induced by transport phenomena
- modelling of transport phenomena
- Propose and validate structure and composition of CCL with improved catalyst efficiency and durability



## METHODOLOGY

FURTHER TOOLBOX								
CCL (TME, CHEM, ICL, CEA) Reference (TME, CC) Customized (TME, CC) Composition	Molecular Dynamic -MD (UCA) Ionomer structure & properties	Lattice- Boltzmann -LB (DLR) Transport Sub µmeter scale	Direct Numerical Simulation - DNS (CEA) Transport Sub µmeter scale	Electrokinetic Model - EM (ICL) Electrochemistry Exchange current density depending on activitities	Pore Network Modeling - PNM (INPT) Two phase flow CCL thickness scale + MPL + GDM	Continuous Performance Model – CPM (DLR) Transport and Electrochemistry Cell scale		
<u>New</u> ionomer – I (CC) <u>Original</u> Catalyst – Pt/C (TME) <b>Formulation</b> I/C Ratio								
Pt & C density in CCL	7/	EXPERIMENTS						
Design Pt loading Thickness Model (ICL, CEA) Ultrathin (ICL) Ionomer &Pt free (CEA)	Components & CCL properties (UES, UCA, ICL, CEA) lonomer, C H <sup>+</sup> , e <sup>-</sup> , Heat, Hydrophilicity	Microstructure (CEA, UES) 3D Pt, C, lonomer, pore distributions	Operando Local conditions (PSI, IEM, CEA) T, RH, H <sub>2</sub> O H <sup>+</sup> & O <sub>2</sub> Activities	Electrochemical measurements Free of transport (ICL) Electrokinetic data	Mass transfer limitations in differencial cell (PSI, CEA, DLR) O <sub>2</sub> , H+ overvoltages	Performance and durability tests in real conditions (DLR, CEA) I-V, $\mu$ V/h		