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One Day Workshop on Monitoring, Diagnostics and Control for Fuel Cells

Improving fuel cells performance through innovative diagnosis and control

4 July 2017 – Lucerne (CH)

KKL - European Fuel Cell Forum 2017

venue: www.efcf.com/SE

registration: www.efcf.com/MDCreg

info: MDC@efcf.com

The workshop presents the current status and the most recent advancements concerning research on monitoring, diagnostics and control of both PEMFC and SOFC systems. It is jointly organized by the projects DIAMOND* and HEALTH-CODE.

DIAMOND aims at a substantial improvement of the current performance of SOFC systems for CHP applications to boost their market deployment. Advanced monitoring tools are developed to integrate diagnostic and control functions with the objective of having meaningful information on the current state-of-the-health of the entire system.

HEALTH-CODE focuses on developing advanced monitoring and diagnostic tool for μ -CHP and backup PEM fuel cell systems equipped with air and O₂-fed stacks, respectively. Such a tool is based on the measurement of the electrochemical impedance spectroscopy (EIS) while the stack is running in real configurations. Particularly, EIS allows the identification of FC current status to support the detection of five stack failure modes, as well as inferring on its remaining useful life.

Both projects implement a holistic view over stack and system, enabling advanced management and providing a comprehensive solution to the problem of achieving improved performance and maintenance scheduling, higher reliability and, thus, increased lifetime of PEMFC and SOFC.

The workshop gathers engineers and researchers from industry, academia and research institutions interested in the most recent advancements on monitoring, diagnostics and control tools. A comprehensive overview and the exploitation potential of the projects results are offered to the interested stakeholders and users at various academia, industry and research levels. Emphasis is given to methodological approaches for monitoring and diagnostics that can help achieving reliable performance of both stacks and BoP components. Control techniques, along with their applications for SOFC performance optimization, are also presented.

The workshop will start with an overview of the projects; then, main results will be reported on the experimental activity and on various approaches for monitoring, diagnostics and advanced control. The work of more than 40 scientists and engineers from 14 teams will be presented aiming at drafting a coherent scenario for the effective development of monitoring, control and diagnostic methodologies to improve performance and durability of fuel cells. Guests from industry will bring their knowledge, expertise and perspectives. At the end, an open discussion among the attendants will be set to share experience and draft future paths towards FC improvements via advanced diagnostics and control.

Registration is free of charge; coffee, beverages and lunch will be offered to all guests.

* The project DIAMOND (Diagnosis-aided control for SOFC power systems) has received funding from the EU Seventh Framework Programme (FP7/2007-2013) for the Fuel Cells and Hydrogen Joint Technology Initiative under grant agreement n° 621208.

The project HEALTH-CODE (Real operation pem fuel cells HEALTH-state monitoring and diagnosis based on dc-dc Converter embedded EIS) has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking under grant agreement No 671486. This Joint Undertaking receives support from the EU Horizon 2020 research & innovation programme.



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PROGRAM

9.00 – 9.10	Welcome	
9.10 – 9.30	Diagnostics and Control for FC – motivations, challenges and main issues	C. Pianese, UNISA
9.30 – 9.50	Description of project DIAMOND	R. Makkus, HYG
9.50 – 10.10	Description of project HEALTH-CODE	C. Pianese, UNISA
10.10 – 10.30	EIS Characterization of O ₂ -fed PEMFC under fault operations	M.C. Péra, UFC
10.30 – 10.50	Influence of operating and faulty conditions on the EIS spectra of PEMFC-based μ -CHP systems	S. Araya, AAU; P. Moçotéguy, EIFER
10.50 – 11.10	Scaling-up technique for PEMFC EIS, from single cell to stack	P. Polverino, UNISA
11.10 – 11.30	Operation results for DIAMOND advanced configuration, Standard control versus Advanced control	R. Makkus, HYG
11.30 – 11.50	Testing and validation of advanced control and diagnostics for SOFC - not quite business as usual	A. Pohjoranta, VTT
11.50 – 12.10	Model-based design of diagnostic tools for conventional and advanced SOFC systems	D. Marra, UNISA
12.10 – 12.30	Total Cost of Ownership reduction of fuel cell systems thanks to diagnosis and prognosis algorithms	S. Faivre, H2SYS
12.30 – 14.00	Lunch break	
14.00 – 14.20	Health-based control and optimisation of SOFC stack operation	Đ. Juričić, IJS
14.20 – 14.40	State-of-health estimation and prognosis of the remaining useful life in SOFC systems	B. Dolenc, IJS
14.40 – 15.00	EIS and soft computing techniques for the diagnosis of O ₂ -feed PEMFC	M.C. Péra, UFC
15.00 – 15.20	Equivalent Circuit Model-based diagnosis of PEMFC via EIS	P. Polverino, UNISA
15.20 – 16.00	Hardware/software design for on-board fuel cell EIS	G. Petrone, W. Zamboni, UNISA; E. Bianconi, BIT
16.00 – 16.20	Advanced control, diagnostics and monitoring for SOFC, the industry perspective	Industry representative TBC
16.20 – 16.40	Discussion among guests, partners, participants	

Affiliation: AAU, Aalborg University (DK); BIT, Bitron Industrie S.p.A. (I); EIFER, European Institute for Energy Research (D); H2SYS, Hydrogen to System (F); HYG, Hygear (NL); IJS, Jožef Stefan Institute (SI); UFC, University of Franche-Comté (F); UNISA, University of Salerno (I); VTT, technical Research Centre of Finland (FI).

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