From Inks to Electrodes - From Lab-Scale to Scale-Up: Correlating Microstructural Parameters to Performance and Degradation in Proton Exchange Membrane Fuel Cells and Water Electrolyzers

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With the recent trends in hydrogen technologies, scale-up fabrication of membrane electrode assemblies (MEAs) for the electrochemical systems such as fuel cells and electrolyzers is gaining significant attention. Companies and researchers are focusing on diverse large-scale electrode fabrication processes, such as roll-to-roll and screen-printing. However, optimizing such processes is not trivial, and a number of parameters, including but not limited to catalyst type, solvent, ink mixing, electrode coating and drying, play a role in the quality of the final product. Correlations between the fabrication parameters and resulting electrode microstructure, properties and performance are important to understand, in order to better control the processes.

Advanced imaging and spectroscopy techniques, together with image and data processing to quantify important structural and compositional parameters, play an important role in this understanding. Information about catalyst distribution, composition, and surface chemistry can be correlated to ink characteristics, and finally to electrode structures, component distribution and properties, and their effect on MEA performance and degradation can be investigated. This talk will offer a plethora of examples of these advanced characterization and quantification techniques within a collaborative project on Overall Research on Electrode Coating Processes (OREO) between four institutions: University of Connecticut, Colorado School of Mines, National Renewable Energy Lab and Fraunhofer ISE.

Biography

Dr. Jasna Jankovic is an Associate Professor in the Materials Science and Engineering Department at the University of Connecticut (UConn) since 2018. Prior to joining UConn, she completed her Ph.D. at the University of British Columbia, Department of Chemical Engineering, under the supervision of Dr. David Wilkinson, followed by a 7 years employment as a Senior Research Scientist at the Automotive Fuel Cell Cooperation in Burnaby, Canada, a joint venture between Ford Motor Company and Daimler. Dr. Jankovic's research focus is in advanced characterization of fuel cells, electrolyzers and batteries using microscopy and spectroscopy techniques, fabrication of novel electrodes for electrochemical devices, as well as Science, Technology, Engineering and Mathematics (STEM) and clean energy education. She has more than 25 years of experience in clean energy sector, extensive list of publications, 2 patents and 2 provisional patents. Dr. Jankovic is a recipient of several prestigious Natural Sciences and Engineering Research Council (NSERC) awards in Canada, a number of National Science Foundation (NSF) awards (including NSF CAREER and PFI awards), and Department of Energy (DOE) sub-awards in the US. Most recently she has been awarded the Fraunhofer-Bessel Research Award by Alexander von Humboldt Foundation, under which she is spending her sabbatical leave at the Fraunhofer Institute for Solar Energy in Freiburg, Germany.