Seminar Topic: On the Degradation of Nanocatalysts for PEM Fuel Cells: An Identical Location Aberration-corrected TEM Study

Presented By: Dr. Paulo Ferreira, Mechanical Engineering Dept. and IDMEC, Instituto Superior Técnico, University of Lisbon

Date: Friday, January 25, 2019
Time: 9:30 – 11:00 AM
Location: UTEB, Room 476

Abstract: Proton exchange membrane fuel cells (PEMFCs) are promising energy conversion devices for transport and stationary applications. Pt-based nanoparticles (NPs) are currently used as the catalyst to promote the kinetics of the hydrogen oxidation and oxygen reduction reactions in the anode and cathode of the fuel cell, respectively. Yet, a fundamental understanding of the behavior of Pt-based NPs during the various stages of fuel cell cycling is lacking. For this purpose a set-up was developed to simulate the effect of voltage cycling on the cathode side of the fuel cell, such that pre-defined locations of the electrocatalyst on a TEM grid were analyzed before and after cycling using an aberration-corrected JEOL ARM 200F. The results show the motion of NPs during the initial stages of cycling, followed by the appearance of single atoms/atomic clusters on the surface of the carbon support after voltage cycling due to dissolution of NPs. As a result, single atoms move on the surface of the carbon support and redeposit on the surface of larger NPs through modified Ostwald ripening.

About the Author: Paulo Ferreira is currently a Full Professor in the Department of Mechanical Engineering at IST, University of Lisbon, Portugal. He is also the Head of Department of Advanced Electron Microscopy, Imaging and Spectroscopy at the International Iberian Nanotechnology Laboratory (INL), Portugal and an Adjunct Professor, Robert & Jane Mitchell Endowed Faculty Fellowship in Engineering in the Materials Science and Engineering Program at the University of Texas at Austin, USA. He has a Ph.D in Materials Science and Engineering from the University of Illinois, USA and has done his Post-doctoral work at MIT in Materials Science and Engineering. He concentrates his scientific research in the areas of Nanomaterials, Nanotechnology and Electron Microscopy applied to Alternative Energy Technologies.

Contact:
Prof. Jasna Jankovic
Assistant Professor, Materials Science & Engineering Dept.
Center for Clean Energy Engineering
44 Weaver Road, Unit 5233
Storrs, CT 06269-5233
Email: Jasna.Jankovic@uconn.edu