**Materials Engineering Program**

**Texas Center for Superconductivity at the University of Houston**

**Center for Integrated Bio and Nano Systems**

# Advanced materials for green hydrogen fuel cells as renewable energy sources -challenges and perspectives


## Prof. Nevenka R. Elezovic

**University of Belgrade – Institute for Multidisciplinary Research,**
**Center of Excellence for Green Technologies, Kneza Viseslava 1, 11000 Belgrade, Serbia**


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**Abstract**:

Hydrogen is considered as pure, environmental friendly fuel for low temperature fuel cells, promising future renewable power sources. In line with this fact, in this research synthesis and characterization of the ceramic based supports by different chemical and electrochemical procedures, to replace state of the art carbon based were performed. Synthesis of the Pt and Pd nanocatalyst for PEMFCs onto these supports was done, as well. The main objective was the characterization of the catalysts for green hydrogen PEM fuel cells reactions: oxygen reduction and hydrogen oxidation. The novel ceramic supports – tin oxide and titanium oxide doped by Nb, tungsten oxide/carbide were successfully synthesized and characterized. High surface area, one of the most important demands was achieved for tin oxide, titanium oxide and tungsten oxide/carbide based supports. Pt and Pd based catalysts exhibited higher activity and stability in comparison to carbon supported ones. High stability of these novel materials under US DOE standardized stability testing was achieved. The challenges and perspectives green hydrogen fuel cells development were discussed in line with circular economy and sustainable development, following the ongoing energy transition from fossil fuels to environmental friendly renewable sources. The future directions were discussed as well.


**Bio:** Dr Nevenka R. Elezovic completed her PhD in 2005, from University of Belgrade. She is currently Research Professor at the Institute for Multidisciplinary Research, University of Belgrade. Her research interests include: Nanostructured materials and alloys for low temperature fuel cells and water electrolysis application - green energy production. Since 2013 she has been serving as representative of Serbia and member of the European board in European Academy of Surface Technology, http://www.east-site.net. She has published more than 50 papers in reputed peer reviewed journals of eminent Publishers such as Elsevier, Royal Society of Chemistry, The Electrochemical Society and more than 80 conference papers. She has been serving as a reviewer for: Energy and Environmental Science, Applied Materials and Interfaces, Journal of Materials Chemistry A, Electrochimica Acta, Applied Catalysis B: Environmental, RSC Advances, PCCP, Chemical Communications, Journal of the Electrochemical Society, International Journal of Hydrogen Energy, as well as adjudicative (senior) reviewer for Energy and Environmental Science, Journal of Materials Chemistry A and Physical Chemistry Chemical Physics. She has given numerous invited lectures at the International conferences, recently at International Summit on Conventional and Sustainable Energies, March 30-31, 2018 Orlando, Florida, USA; Global Experts Meeting on Frontiers in Green Energy and Expo, October 14-16, 2019 Rome, Italy; Materials, the Building Block for the Future 3rd AAAFM-UCLA conference, California, USA, August 18-20 2021; International Process Metallurgy Symposium and EAST FORUM 2021, 9th – 10th November 2021 Aalto University Dipoli,Finland;