UNIVERSITÀ DEGLI STUDI DI PADOVA

DiSC

Venerdì 6 Settembre alle ore **15** presso l'Aula G
Dipartimento di Scienze Chimiche, via Francesco Marzolo 1

Dott. Stefano Mezzavilla

Imperial College London, Department of Materials, Royal School of Mines, London

terrà il seminario:

"Advanced materials for energy conversion technologies - from PEM fuel cells to the electrocatalytic reduction of CO_2"

Electrochemical energy conversion technologies, such as fuel cells and electrolysers, are progressively entering our daily lives and they will undoubtedly play an essential role in our future energy conversion landscape. They also have the potential to revolutionize the production of commodity chemicals, by converting CO_2 to value-added compounds while making direct use of renewable electricity. To enable these technologies, major breakthroughs are necessary to discover active and stable functional electrode materials, i.e., electrocatalysts, capable to accelerate target reactions.

In this presentation I will discuss two relevant cases where the rational synthesis and characterization of electrocatalysts led to important advances in the preparation of stable electrodes and in the understanding of electrocatalytic processes.

In the first part I will present a class of advanced catalysts – made of Pt alloys nanoparticles encapsulated in porous carbon spheres – for the oxygen reduction reaction in PEM fuel cells. Exploiting the pore-confinement effect, we were able to synthesize catalysts with remarkable mass activities coupled with an excellent stability over an extended accelerated degradation protocol.[1,2] In the second part, I will present an experimental investigation of gold single crystals having well-defined surface orientations for the electrocatalytic conversion of CO_2 to CO. Here, we showed that atomic steps and undercoordinated sites control the activity of Au for the electrocatalytic CO_2 reduction.[3]

[1] Mezzavilla S., Baldizzone C. et al. *ACS Catalysis* **2016**, 8058–8068.
[2] Baldizzone C., Mezzavilla S. et al. *Angewandte Chemie Int. Edition* **2014**, 53, 14250–14254.
[3] Mezzavilla S. et al. *Angewandte Chemie Int. Edition* **2019,** 58, 3774–3778.

Biosketch. Dr. Stefano Mezzavilla graduated in Materials Engineering at the University of Trento (Italy). In 2015 he obtained a PhD in Chemistry at the Max-Planck Institute für Kohlenforschung (Germany) investigating advanced nanostructured catalysts for the application in PEM fuel cells. In 2016 he was awarded a Marie Skłodowska Curie individual fellowship, with a project focused on the electrocatalytic reduction of CO_2 with model catalysts. Since August 2018 he is an independent Imperial College Research Fellow at the department of Materials at Imperial College London. His research interests focus on the design, synthesis and characterization of efficient electrocatalysts for energy conversion processes.

Il Direttore del Dipartimento
Prof. Michele Maggini

Prof. Silvia Gross