



**Seminar Topic:
A Brief Introduction on Pt Electrochemistry: The Story
Behind Nano-sizing**

Professor Xu Zhichuan Jason

Abstract

The development of fuel cells and water electrolyzers has been reaching a technical bottom-neck for years. The high cost of Pt catalysts is one of the most critical issues in these devices. Much effort has been given in recent years on exploring alternatives to Pt or reducing the usage of Pt in electrodes. Exciting progress has been made. For example, bimetallic Pt-X catalysts exhibited significantly improved activity towards oxygen reduction reaction. Non-precious metal catalysts, such as sulphides, doped carbons, transition metal oxides, etc., have also been investigated intensively and some of them are found highly active for hydrogen evolution, oxygen reduction, and oxygen evolution reactions. In this talk, we put our attention on the conventional electrode material, Pt, which is also the state-of-the-art electrode in those devices. Pt is the best single element in the elemental table for fuel cells and the cathodic reaction (HER) of water electrolyzers. The most fundamentals of fuel cell and electrolyzer electrochemistry are established through investigating Pt and its electrochemical behaviour. This presentation will introduce the electrochemistry of Pt in terms of electrochemical surface area (ECSA), ORR, MOR, and HER. Some concepts related to the catalyst performance evaluation, such as specific activity (intrinsic activity), mass activity, and stability will be discussed. The origin of size effects on activity and durability of Pt catalysts will be also introduced. With these understandings, one should be able to extend the knowledge and protocols of Pt to other new catalysts under the development. This talk may be also helpful to new electrochemistry learners, who are interested in new electrocatalyst development.

Biography

Dr Xu is a Professor in the School of Materials Science and Engineering, Nanyang Technological University. He received his PhD degree in Electroanalytical Chemistry and BS degree in Chemistry from Lanzhou University, China in 2008 and 2002 respectively. He received his PhD training at Lanzhou University (2002-2004), Institute of Physics, CAS (2004-2005), and Brown University (2005-2007). He moved on to work in the State University of New York at Binghamton as a Research Associate in 2007 and in Massachusetts Institute of Technology as a Postdoctoral Researcher in 2009. Dr Xu has received several awards such as Chun-Tsung Endowment Outstanding Contribution Award - Excellent Scholar in 2018 and the Zhaowu Tian Prize for Energy Electrochemistry by International Society of Electrochemistry (ISE) in 2019. Dr Xu is a member of the International Society of Electrochemistry (ISE), The Electrochemistry Society (ECS), and the American Association for the Advancement of Science (AAAS). He was awarded Fellow of Royal Society of Chemistry (FRSC) on Nov 2017. He also served as the President of ECS Singapore Section. Dr Xu is a Highly Cited Researcher by Clarivate Analytics, Web of Science (2018 - 2020).

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Hosted by: Assistant Professor Lai Changquan