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Electrochemical (ORR/OER/HER) applications of carbon nitride-based materials

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Considering the ever-increasing demand of energy coupled with environmental concerns, alternative energy production/conversion/storage systems, especially full cell, metal air batteries, and electrochemical hydrogen production are highly desirable. Oxygen reduction/evolution reaction (ORR/OER) and hydrogen evolution (HER) are the key reactions of abovementioned energy harvesting systems. Advanced electrocatalyst based on graphitic carbon nitride (g-C₃N₄) is designed and fabricated through three key strategies: Firstly, nanosized 1D g-C₃N₄ nanostructure is designed, prepared, characterized and tested through the facial and large-scale method with high surface area and suitable nitrogen amount. Secondly, Ni/Co oxides/hydroxides decorated 1D g-C₃N₄ nanostructures fabricated with controlled Ni/Co^{+2/+3} as different oxidation states of metals that play important role in electrocatalytic reactions. Thirdly, very thin g-C₃N₄ nanosheets is coated on 1D nanostructures of metal oxides/hydroxides for

M-N(nitrogen) bonding and strong coupling. Finally, these metals along with nitrogen have the intrinsic electrocatalytic activity, so the catalyst designed in such a way to take the advantages of all the active sites and due to pinning of metal oxides/hydroxides on g-C₃N₄ backbone the well stable and long run electrocatalyst is devolved.

Speaker Biography

Muhammad Tahir obtained his B.S. and M.S. degrees in 2008 and 2011 from the Center for High Energy Physics, University of Punjab, Lahore, Pakistan in the field of computational physics and high energy physics respectively. He completed his Ph.D. in Materials Physics and Chemistry from the Beijing Institute of Technology in 2015. He completed (2015-2017) his postdoc from Tianjin University, China. His research interests include the design and synthesis of Nano-structure materials and their applications in electro-catalysis, photocatalysis and Super-capacitor. He has published more than 50 papers as an author/co-author in peer reviewed international SCI journals with various publishers including world premium scientific journals like, JACS, Advanced Energy Materials, Nano Energy, Nano Research, Nanoscale, ACS energy Letters, Scientific Report etc. His total impact factor is about 300 with 22 h-index. He has also provided services as a reviewer for International journals such ACS, RSC, Willey and Springer etc.

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