Electrocatalysis of Metal-Nitrogen-Carbon Hybrid Nanomaterials

by

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Abstract: Metals-nitrogen-carbon (Me-N-C) hybrid nanomaterials have shown great prospect as low-cost alternatives to precious metal catalysts for many important energy conversion reactions. This presentation introduces our recent efforts to make Me-N-C based electrocatalysts and understand the oxygen and hydrogen electrocatalysis of these materials using DFT calculations. In pyrolytic conversion of N-containing carbon molecules into Me-N-C catalysts, we have employed a variety of strategies to increase the density of accessible active sites by controlling the pyrolytic processes, for instances, using graphene sheets (GS) as substrates to grow Fe-N doped CNT/GS composites, using CNT-inserted MOF to grow interconnected Me-N doped carbon nanoframes, and using crystallites of inorganic salts as templates and confining reactors to prevent the loss of active precursors during the pyrolysis. We have also made extensive effort to improve the catalytic performance of Me-N macrocyclic molecules, the roots of the Me-N-C catalysts, by controlling the molecular architectures on carbon supports, forming conjugated structures, adding substituents, and investigating the pH effects. In addition, DFT calculations have been performed to understand the electrocatalytic properties of pyrolytic Me-N-C materials and Me-N macrocyclic molecules.

About the speaker: Prof. Chen is currently a Luojia Professor in Chemistry in Wuhan University. He obtained the BS and PhD degree in Chemistry from Wuhan University in 1991 and 1996, respectively. He was a Postdoctoral Fellow in Southern Methodist University in USA and Imperial College London, UK before joining Wuhan University in 2004. His research interests mainly focus on electrocatalysis, nanoelectrochemistry, theoretical and computational electrochemistry.

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