MISSOURI S&T Chemistry Seminar

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4:00 pm in 303 Schrenk Hall

Development of Catalytic Membranes and Composites for Energy Storage Devices and Nonenzymatic Biosensors

Abstract: The continuous excessive usage of fossil fuels has resulted in its fast depletion, leading to an escalating energy crisis as well as several environmental issues leading to increased research towards sustainable energy conversion. Electrocatalysts play crucial role in the development of numerous novel energy conversion devices, including fuel cells and solar fuel generators. In particular, high-efficiency and cost-effective catalysts are required for large-scale implementation of these new devices. Over the last few years, transition metal chalcogenides have emerged as highly efficient electrocatalysts for several electrochemical energy conversion processes such as water splitting, oxygen reduction reaction and solar energy conversion. These transition metal chalcogenides exhibit high electrochemical tunability, abundant active sites, and superior electrical conductivity. Hence, they have been actively explored for various electrocatalytic activities. Herein, we have explored of transition-metal chalcogenide electrocatalysts for oxygen evolution, oxygen reduction, and illustrated structure–property correlation with the help of density functional theory (DFT). Lastly, we will discuss the electrocatalytic activity of the transition metal chalcogenides towards biomolecule conversion, enhancing their applicability as biosensors for detecting potentially life-threatening disorders. Detailed studies of the chemical reactivity, electrochemical activity, interfacial chemistry, and functional stability of the transition metal chalcogenides that make all these applications feasible will be discussed in depth.