

Molecular Machineries of Electrolytic Water Splitting

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The electrolytic splitting of water into its elements is Reaction No.1 in modern electrochemistry. Discovered by van Troostwijk, Nicolson, Carlisle, and Ritter, water splitting and its half-cell constituents - hydrogen evolution (HER) and oxygen evolution (OER) – later became the most widely explored electrochemical model reactions in works by Bockris, Parsons, Conway, and Gerischer. Over the past decade, advanced characterization methods have offered new molecular insights into the reactive interface of catalyst and electrolyte. Today, water splitting using renewable power is an emerging industrial process technology to generate “green” hydrogen, a versatile energy vector for the decarbonization of power generation, heat, mobility, and industry.

In this presentation, I will share some of our work on the design and characterization of electrocatalytic materials, interfaces and mechanisms of the electrochemical oxygen evolution reaction (OER). Catalytic materials such as Iridium oxide and Nickel oxides along with similarities and differences in their mechanisms in acid and alkaline environments will be discussed.