

Single-Atom Catalysts and High-Entropy Nanomaterials for Water Splitting



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Speaker

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Abstract

In recent years, single-atom catalysts (SACs) and high-entropy nanomaterials (HENs) have gained significant attention as innovative strategies to improve the efficiency and stability of water-splitting reaction systems. SACs, characterized by their atomically dispersed active sites, provide maximized catalytic activity and selectivity while minimizing the use of precious metals. On the other hand, HENs, which feature the synergistic combination of multiple elements within a single nanoscale framework, offer exceptional structural stability, enhanced electronic properties, and tunable catalytic behavior. The combination of SACs and HENs presents a promising avenue to synergistically enhance the overall performance of water-splitting systems. By integrating the unique advantages of single-atom active sites with the multifunctional properties and compositional flexibility of HENs, it is possible to achieve highly efficient and durable catalysts for sustainable hydrogen production. Such hybrid catalysts have the potential to address key challenges in (photo)electrochemical water splitting, including sluggish reaction kinetics and long-term operational stability. In this talk, we will present our recent advancements in the development of SACs and HENs tailored for efficient (photo)electrochemical water splitting applications. Additionally, we will explore the strategies for combining these two material platforms to achieve synergistic effects, emphasizing their design principles, synthesis methodologies, and catalytic performance. This integrated approach not only offers insights into the fundamental mechanisms driving enhanced activity and stability but also paves the way for practical applications in clean energy technologies.

[Keywords] water splitting, single-atom catalysts, high-entropy, hydrogen production, photoelectrochemical