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## Nanostructured Catalytic Materials for Efficient Energy Conversion and Storage

**Invited Talk**

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### Abstract

To achieve a sustainable, low-carbon future, we must overcome the critical challenge of efficiently converting and storing renewable energy. Nanostructured materials have emerged as a powerful solution, leveraging their exceptional physical, chemical, and electronic properties to dramatically enhance energy device performance. At the core of this performance breakthrough lies interfacial engineering, where precisely tailored surface chemistry governs electrocatalytic activity, stability, and efficiency. Advances in nanoscale synthesis now enable the rational design of high-performance, noble-metal-free catalysts that are both economical and scalable. We highlight innovative nanocatalysts developed for critical energy-conversion reactions, placing particular emphasis on advanced water-splitting systems for sustainable hydrogen generation. By strategically bridging nanoscale engineering with industrial scalability, we pave a viable pathway toward efficient, cost-effective, and sustainable energy technologies.

**Keywords:** Nanocatalysts, Water splitting, Hydrogen generation, Photocatalysis, Photoelectrochemical cells, Energy Conversion and Storage


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