Special Issue

Innovative Catalyst Design for the Oxygen Reduction Reaction for Fuel Cells

Message from the Guest Editors

As an essential electrocatalytic process in fuel cells, oxygen reduction reaction (ORR) electrodes in fuel cells face challenges, including the low activity and stability of non-precious catalysts, as well as issues with mass transport and water management. Additionally, the high cost and degradation of platinum-based catalysts, coupled with difficulties in optimizing electrode structure and scalability, hinder the efficiency and practicality of fuel cells. In response, substantial efforts have been dedicated to developing and optimizing a range of catalysts, including non-precious metals, alloys, and nanostructured materials, to achieve high catalytic activity and durability under practical operating conditions. Recent innovative strategies involve refining the surface structure, electronic properties, and composition of catalysts to boost ORR performance. This issue highlights recent breakthroughs in catalyst synthesis, mechanistic studies of ORR, and design principles that promise to advance sustainable and scalable fuel cell technologies for applications in transportation, portable electronics, and renewable energy systems.

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