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Recent Advances in Low-Pt Electrocatalysts for Fuel Cells

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Abstract Proton exchange membrane fuel cells (PEMFCs) are highly efficient energy storage and conversion devices. Thus, the platinum-group-metal (PGM)-based catalysts which are the dominant choice for the PEMFCs have received extensive interest during the past couple of decades. However, the drawbacks in the existing PGM-based catalysts (i.e., high cost, slow kinetics, poor stability, etc.) still limit their applications in fuel cells. The low-content Pt-based core-shell catalysts potentially alleviate these issues, and further improve the oxygen reduction reaction (ORR) activity and stability. This talk focuses on the synthetic strategies, catalytic mechanisms, influencing factors on enhanced ORR performance, and the applications in PEMFCs for the Pt-based core-shell catalysts. We also discuss the membrane electrode assembly (MEA) performance of Pt-based catalysts in fuel cell cathodes and evaluate their potential in real PEMFCs for light-duty vehicle (LDV) and heavy-duty vehicle (HDV) applications. Even though some challenges to the activity and lifetime in the fuel cells remain, particularly for the HDV applications, the Pt-based core-shell catalysts are expected to be promising catalysts for many practical PEMFC applications.

Keyword(s)

Fuel cells, Low-platinum, Core-shell, Oxygen reduction reaction, Heavy-duty vehicle

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