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Durable Electrocatalyst Support Materials Based on N-Doped Mesoporous Carbon Nanofibers with Titanium Nitride Overlay Coating for High-Performance Proton Exchange Membrane Fuel Cells

Pavithra Ponnusamy, Manoj Kumar Panthalingal, Geetha Priyadarshini Badhirappan, and Biji Pullithadathil*

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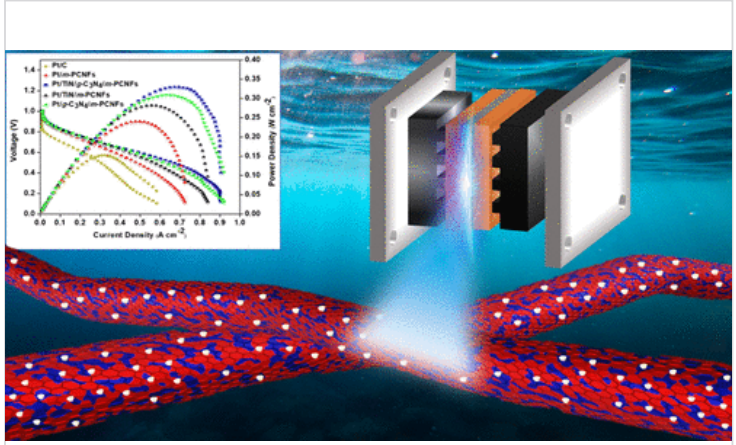

Sustainable endurance of the membrane electrode assembly (MEA) is a major obstacle that hinders the widespread commercialization of PEM fuel cell (PEMFC) technology. Herein, we have successfully demonstrated the construction of an efficient PEMFC using MEAs based on durable N-doped mesoporous carbon nanofibers (g-C_3N_4/*m*-PCNFs) functionalized with a thin overlay coating of titanium nitride (TiN) as catalyst support materials with well-distributed 2–3 nm Pt electrocatalysts (Pt/TiN/*g*-C_3N_4/*m*-PCNFs), which could significantly improve the carbon corrosion resistance and inhibit electrocatalyst degradation. Surface modification on the carbon support backbone using N-doping with *g*-C_3N_4 and Ti–N–C moieties provides strong metal support interactions to the catalyst layer on the MEA, facilitating ORR activity and stability. The surface-engineered Pt/TiN/*g*-C_3N_4/*m*-PCNFs exhibited outstanding electrocatalytic performance (electrochemical surface area (ECSA) = 95 m^2/g) compared to commercial Pt/C