

Two-dimensional Titanium Carbide MXenes as Oxygen Reduction Reaction Electrocatalysts for Fuel Cells

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MXenes, with 2D layered structure, possess metallic conductivity, hydrophilicity, and stability suitable for application in electro and photocatalysis. These materials have gathered increasing interest in the 4 electron-driven oxygen reduction reaction (ORR) for the development of polymer electrolyte membrane fuel cells (PEMFC). We assess selected Ti_2C and Ti_3C_2 as highly active and stable catalysts in alkaline media. Dealumination treatments at optimized conditions were first carried out in the presence of HF or LiF in HCl for both Ti_2AlC and Ti_3AlC_2 corresponding parent materials. The treated materials characterized by SEM, ICP, and XRD unveiled the emergence of interplanar mesoporosity following Al etching. The materials were then assessed for ORR compared with KB in 1M $KHCO_3$. Preliminary results showed decreased onset potential and extended current densities, underlying the promising applications of these materials in ORR. Further studies to enhance the catalytic performance, including the coupling of state-of-the-art co-catalysts, are currently under consideration.