Synthesis of MnO_2 Carbon Nanotubes catalyst with enhanced Oxygen Reduction Reaction for Polymer Electrolyte Membrane Fuel Cell

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Abstract:

Polymer Electrolyte Membrane Fuel Cell (PEMFC), an electrochemical power generating technology, uses a precious metal Platinum (Pt) catalyst for Oxygen Reduction Reaction (ORR), which is a major hindrance in its commercialization. Using a non-precious group metal (NPGM) instead of Pt will reduces the cost of PEMFCs. Herein MnO2 carbon nanotubes (CNTs) were synthesized by impregnating the transition metal in large surface carbonaceous material CNTs by hydrothermal synthesis techniques. To enhance the catalytic reaction and increase the volumetric current density, the sample was pyrolyzed at 800 ^{0}C temperature under nitrogen atmosphere. During pyrolysis, the nitrogen was also doped in the framework of carbonaceous materials. The materials were then treated with acid, removing the unreacted metals and adding oxygen functional group to the CNT framework due to which the activity of the catalyst is amplified. The catalysts have been characterized by scanning electron microscope (SEM), X-ray diffraction (XRD), Catalyst activity has been calculated by Rotating Disc Electrode (RDE) experiment. The resulting materials are stronger in experimental conditions in alkaline environment and have high electro catalytic activity for oxygen reduction reaction (ORR). Linear Sweep Voltammetry (LSV) depicts a current density of - 4.0 mA/cm^2 and over potential of -0.3V vs. Standard Calomel Electrode (SCE) in 0.1M KOH electrolyte. Rotating Disk Electrode (RDE) was conducted at 400, 800, 1200, and 1600 rpm. The results of MnO_2CNT are expected to be desirable in fuel cell commercialization.

Biography:

Abid ullah has done Bachelor in Chemical Engineering from UET Lahore and Master in materials for Energy Storage and Conversion from United States-Pakistan Center for Advanced Studied in Energy. He had also worked as a visiting researcher in Fuel cell Lab of Arizona State University United States**.**