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Low cost anode electrocatalyst for Direct Methanol Fuel Cell applications

Syed Javaid Zaidi*, Sajeda Adnan Mutlaq Alsaydeh, Ammar Bin Yousaf

Center for Advanced MaterialsQatar University
* szaidi@qu.edu.qa

Direct methanol fuel cell has attracted worldwide attention as a promising alternative clean energy source due to growing environmental problems. A number of scientific groups are working to develop the fuel cells and make it a viable clean energy option. For fuel cells to be a feasible and economic viable innovation in the materials development, such as new electrocatalyst and polymer electrolyte membranes are required. Significant advancements in materials developments are required for fuel cells to be feasible for a wide range of portable, automotive and stationary applications. For DMFC, there are some challenges that need to be addressed before this technology become competitive, for example- slow kinetics of methanol oxidation, high methanol permeation resulting drop in fuel cell performance and the high cost of the catalyst. In the present work we focus on the electrocatalyst materials development for methanol electro-oxidation on the anode surface of DMFC. Platinum (Pt) and/or copper (Cu) based multi composition low cost electro-catalyst have been synthesized and characterized by impregnating onto the carbon nano-tubes (CNT) composites. These nanocomposite electrocatalyst materials have been characterized for their morphology by scanning electron microscopy (SEM), structure by X-Ray Diffraction (XRD), element mapping and other chemical and thermal properties by Fourier Transform Infrared Spectroscopy (FTIR), thermogravimetric analysis (TGA), and X-ray Photoelectron Spectroscopy (XPS). The results of the characterization confirmed successful formation of the desired electrocatalyst material. The electrochemical activity of these electro-catalysts for methanol electro-oxidation have been studied by cyclic voltametry (CV) and chronoamperometery (CA) at various concentrations of methanol and

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current density. The characterization and electrochemical activity tests showed good performance for the electro-oxidation of methanol for DMFCs. The present study opened up new avenues for developing lower cost Pt-based catalysts with better performance. These nanomaterials have potential to be used as electrocatalyst for DMFC applications. Keywords: Electrocatalyst, nanocomposite;direct methanol fuel cells, electro-oxidation. Acknowledgements: This publication was supported by Qatar university Internal Grant No. QUUG-CAM-15\16-2. The findings achieved herein are solely the responsibility of the author[s].