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Fabrication and Characterization of PPy/rGO|PPy/ZnO Composite with Varying Zno Concentration as Anode for Fuel Cell Applications

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Abstract : The rapid growth of electricity demand has led to a pursuit of alternative energy sources with high power output and not harmful to the environment. The fuel cell is a device that generates electricity via chemical reactions between the fuel and oxidant. Fuel cells have been known for decades, but the development of high-power output and durability was still one of the drawbacks of this energy source. This study investigates the potential of layer-by-layer composite for fuel cell applications. A two-electrode electrochemical cell was used for the galvanostatic electrochemical deposition method to fabricate a Polypyrrole/rGO|Polypyrrole/ZnO layer-by-layer composite material for fuel cell applications. In the synthesis, the first layer comprised 0.1M pyrrole monomer and 1mg of rGO, while the second layer had 0.1M pyrrole monomer and variations of ZnO concentration ranging from 0.08M up to 0.12M. A constant current density of 8mA/cm^2 was applied for 1 hour in fabricating each layer. Scanning electron microscopy (SEM) for the fabricated LBL material shows a globular surface with white spots. These white spots are the ZnO particles confirmed by energy-dispersive X-ray spectroscopy, indicating a successful deposition of the second layer onto the first layer. The observed surface morphology was consistent for each variation of ZnO concentrations. AC measurements were conducted to obtain the AC resistance of the fabricated film. Results show a decrease in AC resistance as the concentration of ZnO increases.

Keywords : anode, composite material, electropolymerization, fuel cell, galvanostatic, polypyrrole
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