ABSTRACT

In this research study, Ag/CuCoO2/rGO nanohybrids is synthesized using hydrothermal method. Graphene, a two-dimensional nanomaterial with exceptional properties such as high electron mobility, heat conductivity, electrical conductivity, and a large surface area, has garnered significant interest from researchers in the past decade. These characteristics make graphene an ideal material for energy storage applications. Combining metal oxides (MO) with reduced graphene oxide (rGO) is an efficient approach to create electrode materials that can significantly enhance the performance of supercapacitors. This research focuses on the synthesis of a novel class of nanohybrids, specifically Ag/CuCoO2/rGO, to be used as an electrode material for supercapacitors. The electrochemical properties of this material were examined using a three-electrode system, including cyclic voltammetry (CV) and galvanostatic charge-discharge (GCD) techniques, with a 6M HCl electrolyte solution. The structural characteristics of the nanocomposites were assessed through X-ray diffraction (XRD), revealing a crystallite size of approximately 28.95 nm. Scanning electron microscopy (SEM) was employed to analyze the surface morphology, which transitioned from an amorphous state to a partially crystalline structure. The Ag/CuCoO2/rGO nanocomposite displayed a high specific capacitance of 780.2727 Fg^-1 in galvanostatic charge-discharge measurements at a current density of 5A/g, within a potential window ranging from 0 to 0.45 V. Additionally, the cyclic voltammetry (CV) curve demonstrated distinct oxidation-reduction peaks, indicating the pseudo-capacitive behavior of the synthesized material across various scan rates, from 5 mV/s to 100 mV/s. This enhanced electrochemical performance is attributed to the effective integration of Ag/CuCoO2 nanoparticles within the rGO sheets, positioning this nanocomposite as a promising candidate for energy storage devices.