ABSTRACT

Environmentally friendly energy storage technologies capable of supplying and storing energy are essential to support the advancement of modern technology. Polyeugenol is a material derived from renewable natural resources and has potential for supercapacitor applications due to the presence of phenolic (−OH) groups that can release protons. Polyeugenol can be modified through crosslinking and the introduction of sulfonic groups (−SO_3H) to enhance thermal stability and ionic conductivity. The presence of sulfonic groups in polyeugenol enables composite formation with graphitic carbon nitride through hydrogen bonding interactions. Graphitic carbon nitride in the composite functions to improve the electrochemical performance of the polymer as a supercapacitor electrode. This study aims to synthesize a sulfonated eugenol–ethylene glycol dimethacrylate copolymer/graphitic carbon nitride composite and to evaluate its performance as a supercapacitor electrode. The research involves the synthesis of the copolymer, followed by sulfonation, synthesis of graphitic carbon nitride, and subsequent composite formation. The synthesized materials were characterized through melting point analysis, solubility testing, molecular weight determination, functional group analysis using Fourier Transform Infrared (FTIR) spectroscopy, crystallinity analysis using X-Ray Diffraction (XRD), and morphological analysis using Scanning Electron Microscopy (SEM). The electrochemical performance was evaluated using Cyclic Voltammetry (CV) and Electrochemical Impedance Spectroscopy (EIS). The results show that the composite was successfully synthesized as a light brown solid with a porous structure and uniform material distribution. FTIR analysis indicates a broadened absorption band, suggesting the presence of O−H groups from the sulfonated copolymer and −NH_2 groups from graphitic carbon nitride. The composite exhibits a specific capacitance of 10.64 F/g and an ionic conductivity of 12×10^{-2} S/cm. These results demonstrate that the composite has potential as an environmentally friendly electrode material for supercapacitor applications.

Keywords: Polyeugenol, sulfonation, graphitic carbon nitride, electrode, supercapacitor.