ABSTRACT

The synthesis of separator membrane for lithium-ion battery (LIB) using PVdF base material, eugenol-derived polymer, and graphene oxide (GO) filler has been carried out. Good heat resistance, high ionic conductivity and high mechanical strength make PVdF a potential material for battery separator development. The addition of eugenol-derived polymers aims to improve electrolyte absorption and make it more environmentally friendly. Modification through sulfonation improves electrochemical stability, while the addition of MBA crosslinking agent improves the ionic conductivity and chemical stability of the membrane, while GO filler improves the ionic conductivity and mechanical properties of the separator. This study aims to synthesize and analyze the effect of variations in PVdF materials, eugenol-derived polymers, and GO. The effect of variations in GO filler composition, and determine the performance of the separator membrane using electrochemical testing. PE synthesis was carried out through cationic polymerization using $BF_3O(C_2H_5)_2$ catalyst. PES and PE-MBAS were synthesized by sulfonation process using H2SO4 through aromatic electrophilic substitution reaction. GO synthesis was carried out using Hummer's method and the separator membrane was made through solvent-casting method. Tests conducted included membrane thickness, hydrophilicity, electrolyte absorption, porosity, biodegradability, and cross-section SEM analysis. Membranes that met the criteria were further tested in the form of a coin cell to improve the performance of the membrane. This research produced PE with a yield of 97.81%, PES 91.61%, PE-MBAS 94.08%, and GO 86%. Membranes with PE-MBAS and GO variations have thicknesses below 60 µm, with good porosity and electrolyte absorption. The addition of GO improved conductivity and electrochemical stability, with the PVDF/PE-MBAS/GO separator showing the best performance: ionic conductivity of 0.098 mS/cm, electrochemical stability of 5.14 V, Rct of 206 Ω, and stable charge-discharge performance.

Keywords: lithium-ion battery, eugenol, graphene oxide, PEMBA, sulfonation.