

Electrochemical performance of poly (3, 4-ethylenedioxythipohene)/nanocrystalline cellulose (PEDOT/NCC) film for supercapacitor

ABSTRACT

Supercapacitor electrode based on conducting polymer of poly (3,4-ethylenedioxythipohene) (PEDOT) doped with nanocrystalline cellulose (NCC) films were prepared via electrochemical polymerization technique. Different applied potential, concentration and deposition time were varied to study the effect of electropolymerization potential, NCC concentration and deposition time on the formation of PEDOT/NCC film. The formation of electrochemically polymerized PEDOT/NCC composite was successfully proven with field emission scanning electron microscope (FESEM) and Fourier transform infrared spectroscopy (FTIR) techniques where the composites exhibited an interconnected network-like surface morphology. PEDOT/NCC deposited at 1.2 V in 1 mg/ml of NCC for 15 min showed the highest specific capacitance of 117.02 F/g at 100 mV/s with energy density and power density of 11.44 Wh/kg and 99.85 W/kg, respectively at the current density of 0.2 A/g. The incorporation of NCC into PEDOT revealed a lower resistance of charge transfers and improves the cycling stability by retaining 86% of capacitance after 1000 cycles.

Keyword: Poly (3, 4-ethylenedioxythipohene); Nanocrystalline cellulose; Supercapacitor