A Novel Dioxythiophene Based Conducting Polymer as Electrode Material for Supercapacitor Application

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The electrochemical polymerization of the functionalized 3,4-propylenedioxythiophene derivative ProDOT-EtO-BZA **1** bearing an oligoether spacer with aromatic carboxylic group was achieved on platinum (Pt) wire and screen printed carbon electrode (SPCE), respectively. The structure, morphology and electrochemical properties of the PProDOT-EtO-BZA films were analyzed by FT-IR, SEM, AFM and electrochemical impedance spectroscopy (EIS), respectively. Furthermore, poly(3,4-propylenedioxythiophene) (PProDOT), the 2,2-dibenzyl derivative (PDBProDOT) and the 2,2-diethyl derivative (PProDOT-Et₂) were electrodeposited onto SPCE via cyclic voltammetry (CV) for comparison of the capacitance performance of these PProDOTs in organic electrolytes to the corresponding data of PProDOT-EtO-BZA. CV and EIS measurements of the PProDOT-EtO-BZA revealed pseudo-capacitive behavior with faradaic reactions. Specific and low frequency capacitance (20.8 mF/cm² and 8.5 mF/cm², respectively) of the PProDOT-EtO-BZA were almost two times higher than those of the other PProDOTs. These results suggest that PProDOT-EtO-BZA films can be utilized as electrode material for supercapacitors.

Keywords: ProDOT, Supercapacitor, Electrochemical Impedance Spectroscopy, Equivalent-Circuit Model, Screen Printed Electrode.

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