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ACCEPTED MANUSCRIPT

Carbazole Based Electrochromic Polymers Bearing Ethylenedioxy and Propylenedioxy Scaffolds

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Abstract

In this study, synthesis of two new monomers; 2-(2,3-dihydrothieno[3,4-b][1,4]dioxin-5-yl)-7(2,3-dihydrothieno[3,4-b][1,4]dioxin-7-yl)-9H-carbazole (ECzE) and2-(3,3-dihexyl-3,4dihydro2H-thieno[3,4-b][1,4]dioxepin-6-yl)-7-(3,3-dihexyl-3,4-dihydro-2H-thieno[3,4-b][1,4] dioxepin-8-yl) -9H-carbazole, (PCzP), via Stille cross-coupling reaction and their electrochemical polymerization both by repetitive cycling and by constant potential electrolysis was reported. The electrochemical and optical properties of the monomers and their corresponding polymers, PECzE and PPCzP, were investigated and it was found that 3,4-ethylenedioxythiophene (EDOT) unit containing monomer and polymer (ECzE and **PECzE**) have lower oxidation potentials and lower band gap values as compared to dihexyl sustituted 3,4-propylenedioxythiophene (PRODOT-6) unit containing monomer and polymer (PCzP and PPCzP). Spectroelectrochemical studies revealed that both of the polymer films exhibit multielectrochromic behavior as well as good electrochemical stability. Moreover, **PPCzP** was found to be soluble in some organic solvents and its solution in tetrahydrofuran can be reversibly oxidized and reduced using chemical reagents. A dual-type electrochromic device was also constructed using soluble **PPCzP** as the anodically coloring material and the optical studies were performed on the device. The electrochromic device showed good electrochromic response, such as reasonable coloration efficiency and redox stability.

Keywords: Carbazole; ethylenedioxythiophene; propylendioxythiophene; electrochromic polymers; electrochromic device.

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