Medium Effect on the Electropolymerization and Electro-optical Properties of PEDOS

Kai Qu^{§1}, Hongtao Liu^{§1}, Nannan Jian¹, Baoyang Lu^{2,*}, Ximei Liu², Jingkun Xu^{1,3,*}

¹ School of Chemistry & Chemical Engineering, Jiangxi Science & Technology Normal University, Nanchang 330013, Jiangxi, China

² School of Pharmacy, Jiangxi Science & Technology Normal University, Nanchang 330013, Jiangxi, China

³ School of Chemistry and Molecular Engineering, Qingdao University of Science and Technology, Qingdao 266042, Shandong, China

*E-mail: lby1258@163.com and xujingkun1971@yeah.net

§These authors contributed equally to this work.

doi: 10.20964/2019.08.74

Received: 19 March 2019 / Accepted: 6 June 2019 / Published: 30 June 2019

3,4-Ethylenedioxyphenylene (EDOS), an important derivative of 3,4-ethylenedioxythiophene (EDOT), has better optoelectronic properties including lower band gap, better interchain charge transfer, lower oxidation and reduction potentials. In this work, the electropolymerization behavior of EDOS, and the electrochemistry, surface morphology, optical and electrochromic properties of the resultant PEDOS films are comparatively investigated in different solvent-electrolyte systems (CH₂Cl₂-Bu₄NPF₆, CH₂Cl₂-BmimPF₆, and pure BmimPF₆). We find that solvent-electrolyte systems exert influence on the electropolymerization behavior of EDOS monomer. EDOS displays lower onset oxidation potentials in CH₂Cl₂-BmimPF₆ and pure BmimPF₆ than commonly employed CH₂Cl₂-Bu₄NPF₆. PEDOS can be facilely electrodeposited in all these systems. Electrochromic results suggest that PEDOS film resulted from CH₂Cl₂-Bu₄NPF₆ medium exhibit relatively good transmittance changes ($\Delta T\%$) of 26.5%, high coloration efficiency of 80 cm² C⁻¹. However, the addition of BmimPF₆ reveal a compact morphology, and enhanced the electrochemical stability and open circuit memory for PEDOS film. From these results, PEDOS can be further explored as electrochromic materials towards indoor electrochromic products and flexible displays.

Keywords: Conducting polymers, Electropolymerization, Electrochromics, 3,4-Ethylenedioxyphenylene, Medium Effect

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