Synthesis and Electrochromic Properties of Two Random Copolymers Containing Benzotriazole, Benzothiadiazole as Electron Acceptors and Benzodithiophene or Indacenodithiophene as Electron Donors

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doi: 10.20964/2019.07.23

Received: 2 March 2019/ Accepted: 22 April 2019 / Published: 10 June 2019

Two random copolymers, poly (benzotriazole-indacenodithiophene-benzothiadiazole) (PBTIDBD) and poly (benzotriazole-benzodithiophene-benzothiadiazole) (PBTBDBD) were synthesized and characterized by electrochemistry, spectroelectrochemistry, electrochromic switching, colorimetry and thermal gravimetric analysis. For PBTIDBD, the color of film changed from rosybrown in neutral state to transparent lightgrey in oxidized state. The band gap calculated according to the spectroelectrochemistry data is 1.86 eV, and the response time, optical contrast, coloration efficiency at 1560 nm are 1.04 s, 62.1%, 276.29 cm²·C⁻¹, respectively. And, for PBTBDBD, its color changes from rosybrown to transparent grey as it was fully oxidized. The band gap is 1.68 eV, and the response time, optical contrast, coloration efficiency at 1560 nm are 2.68 s, 62.4%, 193.31 cm²·C⁻¹, respectively. Both copolymers are stable at a high temperature, and the decomposition temperature of PBTIDBD and PBTBDBD are 463 °C and 326 °C. Both copolymers can be good candidates for electrochromic application.

Keywords: conducting polymers; indacenodithiophene; benzotriazole; benzothiadiazole; benzodithiophene.

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