Synthesis and Characterization of Four Random copolymers Containing Fluorene as Electron Donors and Benzotriazole, Benzothiadiazole, Pyrido[3,4-b]pyrazine as Electron Acceptors

Shuang Chen^{1,2}, Lingqian Kong³, Chaolei Ban⁴, Jinsheng Zhao^{2,*}, Hongmei Du^{2,*}

¹ College of Chemical Engineering, China University of Petroleum (East China), QingDao, 266580, P. R. China.

² Shandong Key Laboratory of Chemical Energy Storage and Novel Cell Technology, Liaocheng University, Liaocheng, 252059, P. R. China.

³ Dongchang College of Liaocheng University, Liaocheng 252000, P.R. China

⁴ School of Materials Science and Technology, Liaocheng University, Liaocheng, 252059, 252059. P.R. China.

*E-mail: j.s.zhao@163.com, duhongmei@lcu.edu.cn

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Four copolymers, poly(fluorene-pyrido[3,4-b]pyrazine) (PFPP), poly(benzotriazole-fluorene-pyrido[3,4-b]pyrazine) (PBTFPP), poly(benzotriazole-fluorene-benzothiadiazole) (PBTFBD), poly(benzothiadiazole-fluorene-benzothiadiazole) (PBDFBD) were synthesized successfully. Afterwards, a series of characterization, including cyclic voltammetry (CV), spectroelectrochemistry, kinetics, colorimetry and thermal gravimetric analysis were carried out to fully investigate the properties of the copolymers we got. Their band gaps are 1.87 eV, 1.91 eV, 1.97 eV and 1.98 eV, respectively. From neutral state to oxidized state, PFPP changes from thistle to transparent gray, PBTFPP changes from tan to transparent gray, PBTFBD changes from sienna to lightslategray, and PBDFBD changes from rosybrown to lightgrey. The coloration efficiencies are $269.91\text{cm}^2\cdot\text{C}^{-1}$ for PFPP, $177.45\text{cm}^2\cdot\text{C}^{-1}$ for PBTFPP, $241.92\text{cm}^2\cdot\text{C}^{-1}$ for PBTFBD, and $174.67\text{cm}^2\cdot\text{C}^{-1}$ for PBDFBD in near infrared region. Except for PFPP, all the other three copolymers are stable and could be good candidates in electrochromic application.

Keywords: fluorene; pyrido[3,4-b]pyrazine; benzotriazole; benzothiadiazole; conducting polymers.

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