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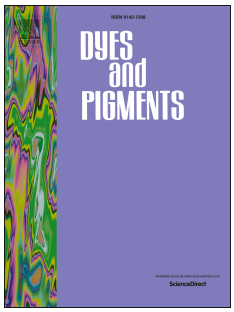

Synthesis and photo physical properties of carbazole based quinoxaline conjugated polymer for fluorescent detection of Ni^{2+}

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Synthesis and photo physical properties of carbazole based quinoxaline conjugated polymer for fluorescent detection of Ni^{2+}

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Abstract

A new series of donor-acceptor (**P1-P3**) conjugated polymers containing carbazole and quinoxaline units have been synthesized through multistep reactions. In the final step, the polymerization was carried out using Wittig reaction. The optical and potential charge – transporting properties of the polymers has been carefully investigated by UV-Vis, fluorescence emission spectroscopy and cyclic voltammetry. Solvent effects on absorption and emission spectra of these polymers have also been studied. Compared with optical spectra of the polymers in solution and in solid state, the solid state of the polymers was significantly red shifted. Cyclic voltammetry experiments showed that these polymers have high lying HOMO energy levels ranging from -5.57 to -5.49 eV and low-lying LUMO energy levels ranging from 3.24 to 3.30 eV. The electrochemical band gap was good agreement with the optical band. Results of TGA and AFM analysis demonstrated that the compounds exhibited good thermal stabilities and smooth roughness. Furthermore, the molecular interactions of polymers with electron donor (N, N'-dimethylaniline) and electron acceptor (dimethyl terephthalate) were also investigated. In addition, the sensing behaviour was observed with various metal ions such as Li^{+}, Na^{+}, K^{+}, Mg^{2+}, Ca^{2+}, Mn^{2+}, Ni^{2+}, Cd^{2+}, Cu^{2+}, Zn^{2+}, Fe^{2+} and Hg^{2+}. The synthesized polymers were shown excellent sensing behaviour towards Ni^{2+} ions. Excellent metal ion sensing and luminescence of our polymer will move towards to the application of chemical and bio sensor field.

Keywords: Conjugated polymer; carbazole; quinoxaline; fluorescence; metal ion sensing; luminescence study

1. Introduction

Intense research activities have been carried out on organic heterocyclic compounds and have received immense attention owing to their potential use in electronic applications. Carbazole has shown great potential in applications such as organic light emitting diodes (OLEDs) [1] thin film transistors, photorefractive materials [2] sensors [3]. Carbazole is a