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ENVIRONMENTALLY FRIENDLY ENZYME-CATALYZED POLYMERIZATION OF A NOVEL PHENOXY-KETIMINE

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Abstract

The monomer with ketimine side group, 2-(1-(benzylimino)ethyl)phenol (2-BEP), was synthesized from the condensation of 2-hydroxyacetophenone and benzyl amine. The enzymatic oxidative polymerization of 2-BEP was performed in the presence of hydrogen peroxide using horseradish peroxidase (HRP) as catalyst. The oxidation reaction was carried out in various solvents and phosphate buffers at room temperature. These studies have shown that a dark brown polymer was successfully synthesized by utilizing aqueous methanol as the cosolvent at pH 7.0. Poly(2-BEP) shows good solubility in DMF and DMSO, but it is insoluble in THF, methanol, water, acetone and chloroform. Characterization of poly(2-BEP) was carried out via UV–vis, FT-IR, ^{1}H-NMR, ^{13}C-NMR and GPC techniques. The number-average molecular weight (M_n), weight-average molecular weight (M_w) and polydispersity index (PDI) of the polymer were determined to be 1157.4 g mol^{-1}, 2039.6 g mol^{-1} and 1.76, respectively. FT-IR and ^{1}H-NMR studies confirmed the presence of phenylene and oxyphenylene units within the polymer backbone. The optical band gaps (E_g) of 2-BEP and poly(2-BEP) were calculated as 4.10 eV and 3.86 eV, respectively.

Key words: enzymatic oxidative polymerization, horseradish peroxidase, phenol derivate

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