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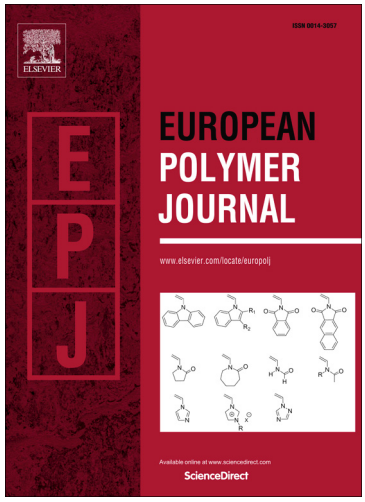

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Characterization of polyaniline synthesized from chemical oxidative polymerization at various polymerization temperatures

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Abstract

We report on the effects from polymerization temperature (T_P) on the thermal de-protonation of anilinium cations into neutral anilines and on the structural and electrical properties of polyaniline emeraldine salt (PANI ES) samples synthesized from chemical oxidative polymerization with ammonium peroxydisulfate as oxidant and with [HCl] varied from 0.7, 1.0, and 2.0 M. From the T_P–dependence of induction period the activation energy associated with this thermal de-protonation is evaluated. With increasing T_P to increase the de-protonation rate, the as-synthesized PANI ES samples possess a weaker hardness, a less crystallinity, a lower molecular weight and a smaller dispersity. From the temperature-dependence of electrical conductivity measured on these doped PANI ES samples and with application of the nearest-neighbor hopping model, the corresponding activation energy for charge transport increases with increasing T_P. Above results reveal that the distribution of polaron states induced by counter-ions in the PANI ES sample synthesized at higher T_P becomes more disorder and hence results in a broader polaron bandwidth.

Keywords: PANI ES; Polymerization temperature; Chemical oxidative polymerization; Induction period; De-protonation; Activated barrier crossing

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