

Electro-induced Oxidative Polymerization of *N*-Vinylcarbazole

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ABSTRACT

*In this study, a novel procedure to increase the yield of the non-crosslinked, photoconductive, white form of linear poly(*N*-vinylcarbazole) (LPVCz) is reported. The yield of LPVCz is increased (up to 53%) by the addition of catalytic amounts of ceric ammonium nitrate as an oxidant during the electrochemical polymerization of *N*-vinylcarbazole in a divided electrochemical cell. The concentration of Ce(IV) remained constant during the polymerization since Ce(III) is readily oxidized to Ce(IV) electrochemically. Since the electrochemical oxidation of Ce(III) to Ce(IV) took place simultaneously at the anode, the deposition of dark green crosslinked polyvinylcarbazole on the electrode surface, which hinders the formation of white LPVCz, can be prevented. The Fourier transform infrared, ultraviolet–visible and fluorescence spectra of white LPVCz showed that the structures of polymers are the same as those produced by conventional polymerization. Copyright © 1999 John Wiley & Sons, Ltd.*

KEYWORDS: Poly(*N*-vinylcarbazole); electroinduced polymerization; ceric salt

INTRODUCTION

Polyvinylcarbazole (PVCz) has been studied intensively owing to its interesting electrical and optoelectronic properties [1, 2]. In spite of the great interest in the electrochemical polymerization of *N*-vinylcarbazole (NVCz) on electrode surfaces [3–7], little attention has been paid to the polymerization in solution by constant-current electrolysis, by constant potential electrolysis as well as by oxidative chemical polymerization by using metal salts [8].

During the electrolysis of NVCz a conducting dark green crosslinked polyvinylcarbazole (CPVCz) is deposited on the electrode surface, while at the same time the polymerization through the vinyl group results in white PVCz precipitated in solution. Owing to the dark green polymer deposition on the electrode surface the formation of the white form of linear PVCz (LPVCz) through the vinyl initiation in solution is hindered.

We have investigated recently the chemical polymerization of NVCz, carbazole and *N*-ethylcarbazole by using ceric ammonium nitrate (CAN) comparatively with electrochemical polymerization [9] and the products were characterized by different techniques. It is found that depending on the CAN concentration the polymers exhibit different color, structure and conductivities. If the oxidant concentration is five times lower than the monomer concentration a colorless polymer is formed for NVCz, indicating that the polymerization proceeds through the vinyl groups (LNVCz), whereas the color of the polymer is dark green in

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