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ORIGINAL PAPER

Preparation of polyaniline in the presence of polymeric sulfonic acids mixtures: the role of intermolecular interactions between polyacids

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Polyaniline (PANI) was synthesized by chemical oxidation of aniline in the presence of mixtures of water-soluble poly(sulfonic acids) of different nature. Under these conditions, the use of polyacid templates leads to the formation of interpolymer complexes of PANI and polyacid mixtures. The obtained PANI complexes were characterized by UV, visible, near IR, and Fourier transform infrared spectroscopy. It was shown that the rigidity of the polyacid backbone and the composition of a polyacid mixture affect the electronic structure of PANI complexes and the duration of the induction period of aniline oxidation. Domination of the more rigid-backbone template in the synthesis of PANI complexes with mixtures of the rigid- and flexible-backbone polyacids was observed. According to the viscometry and FTIR spectroscopic data, the reason of the domination is the existence of the intermolecular interaction between the polyacids in the mixture. In this case, duration of the induction period of aniline oxidation was between these values for pure polyacids.

Keywords: conducting polymers, polyaniline, UV-VIS-NIR, FTIR spectroscopy

Introduction

From the beginning of their history, conductive polymers have been considered as intractable and insoluble. It was an important goal in basic research as well as in application-oriented materials science to develop techniques by which these materials could be processed. The use of solvents was one of the options. During the last years, many papers discussing the solubility of conductive polymers have been published (Wessling, 2007). One of the promising conducting polymers of high environmental stability, low cost, and simple synthesis is polyaniline (PANI). Its practical applications are in sensors, batteries, light emitting and electrochromic devices, solar cells, etc. (Wessling, 2007). To improve its processability and prepare water-soluble or water dispersible PANI, a number of authors reported on the chemical synthesis of PANI in the presence of water-soluble polymeric acids of different structures last years. The most frequently used polyacids are poly(styrenesulfonic acid) (PSSA) (Sun et al., 1997; Yang et al., 1997; Tengstedt et al., 2005; Li et al., 2010), poly(acrylic acid) (PAA) (Sun et al., 1997; Yang et al., 1997;

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