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Improvement of properties of polyaniline by changing the reaction conditions

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Abstract

In this work polyaniline composite and nanocomposites were successfully synthesized in Aqueous solution by using ammonium persulfate ($(\text{NH}_4)_2\text{S}_2\text{O}_8$) as an oxidant in the presence of hydroxyl propyl cellulose (HPC) as stabilizer at 0 and 25 °C reaction temperature. The influence of reduced reaction temperature on polyaniline properties were also addressed. The morphology of the products have been determined by using scanning electron micrograms (SEM). Also Fourier transform infrared spectroscopy (FTIR) and X-Ray diffraction (XRD) have been used to study the characteristics of products such as chemical structure. The results indicate that the morphology, particle size, homogeneity and conductivity of products are dependent on the synthesis conditions. The SEM results indicate that particle size of products decrease and homogeneity increases by using hydroxyl propyl cellulose as surfactant and reducing the reaction temperature. Based on this work, reducing reaction temperature can produce enhanced polyaniline properties.

Key words: Polyaniline, Nanocomposite, Stabilizer, Morphology, Surfactant

1. Introduction

Polymers have long been used as insulating materials. It was believed that polymers are insulators which provide significant advantaged for many application, for example can be used as antistatic coating material to prevent electrical exposure [1]. The potential uses for conductive polymers have since been multiplied due to their ease of processing, good environmental stability and wide range of electrical properties [2]. Since the initial discovery in 1977 [3] by Alan G. MacDiarmid and his coworkers, the development of the conducting polymer field has continued to accelerate at an unexpectedly rapid rate. Various conducting polymers and chemical structures are presented in Figure 1. One of the most important of this group of polymers is polyaniline. First polyaniline coatings with a relatively high electrical conductivity have been produced from soluble polyaniline