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Spectroscopic and Electrical Studies of Conducting Polyaniline Composites Embedded Nanostructure Zinc Sulfide

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ABSTRACT

Simple and low-cost chemical precipitation method was used for the synthesis of ZnS nanoparticles using zinc precursor and DMF as a stabilizing agent. Na_2S was used as the source of sulphur ions. Composites of polyaniline and ZnS nanoparticles have been synthesized by in-situ chemical oxidation method by varying weight percentage of synthesized ZnS nanoparticles with aniline monomer. Optical studies in terms of UV-Vis and fluorescence show the positive effect of incorporation of ZnS in the polyaniline matrix. Higher intensity emission bands are observed in composites as compared to pure polyaniline. Measurement of DC conductivity shows enhanced conductivity for 5% and 10% composites as compared to pure PANI and other nanocomposites.

Keywords: ZnS nanoparticles, nanocomposites, polyaniline, optical study, electrical conductivity

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1. INTRODUCTION

The history of conducting polymer dates back to 1977 when Hideki Shirakawa, Alan Heeger and Alan MacDiarmid discovered conducting polymer Polyacetylene [1] and since then intensive research has been carried out in the field of conducting polymers. Conducting polymers are the most suitable substances for technological applications because of low-temperature processing capabilities and stability in ambient atmosphere. Their tunable large electrical conductivity, light weight and flexibility make conducting polymers very important and desirable than metals in many applications. Among different conducting polymers discovered, Polyaniline (PANI) is a unique conjugated polymer since it can be tailored for specific applications through a non-redox acid-base doping process. PANI and PANI-based nanocomposites have been studied for electronic and optical applications such as EMI shielding devices, anticorrosion coatings, sensors, lightweight battery electrodes, electrochemical actuators and many more [2–6]. Unlike other polymers, polyaniline occurs in three different forms depending on its oxidation states as shown in Figure 1.

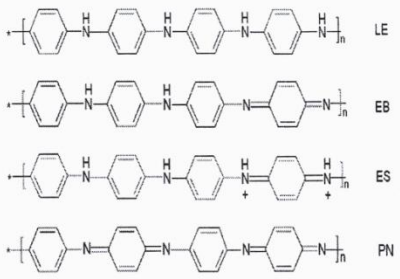

***Fig. 1:** Different Oxidation States of Polyaniline.*

LE (leucoemeraldine base): fully reduced form; EB (emeraldine base): 50% oxidized form;PN (pernigraniline base): fully oxidized form; ES (emaraldine salt): conducting form of polyaniline.

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