

Electrical properties of Cadmium oxide /Polyaniline composites

1. ALEMTEMSU OZUKUM
B.TECH MECHANICAL ENGG.
FARAH INSTITUTE OF TECHNOLOGY
HYDERABAD, INDIA

2.AOSAMA OZUKUM
B.TECH MECHANICAL ENGG.
FARAH INSTITUTE OF TECHNOLOGY
HYDERABAD, INDIA

3.C.THROMWA KONYAK
B.TECH MECHANICAL ENGG.
FARAH INSTITUTE OF TECHNOLOGY
HYDERABAD, INDIA

4.NOKDIDONG OZUKUM
B.TECH MECHANICAL ENGG.

FARAH INSTITUTE OF TECHNOLOGY
HYDERABAD, INDIA

5.PENLANG. P
B.TECH MECHANICAL ENGG.
FARAH INSTITUTE OF TECHNOLOGY
HYDERABAD, INDIA

6.J.SASI KIRAN
PROF.CSE
FARAH INSTITUTE OF TECHNOLOGY
HYDERABAD,INDIA

7.SYED ASLAM
PROF..MECHANICAL ENGG.
FARAH INSTITUTE OF TECHNOLOGY
HYDERBAD, INDIA

ABSTRACT

In the present paper, pure nanocrystalline cadmium oxide compound was synthesized by chemical co-precipitation method. The composite of Polyaniline with nanosized cadmium Oxide was prepared by In-situ chemical oxidation polymerization method with ammonium per sulphate as an oxidant in aqueous hydrochloric acid under constant stirring at 0-4° C in presence of Nitrogen atmosphere. The a.c. electrical conductivities as a function of frequency were measured by four two probe technique. Electrical conductivity of composite with 50 % weight of cadmium Oxide is found to be more among all other composites and even than polyaniline. SEM studies showed that there is strong interaction between polyaniline and nano sized cadmium Oxide particles.

Keywords: SEM, CdO, PANI, AC conductivity .

1 Introduction

In the 1980s, the invention of a conducting polymer changed the traditional understanding that a polymer was only an insulator [1]. Their magnetic composites have become extremely attractive because of their unique and intriguing properties and promising industrial applications [2], such as electrical and magnetic shielding, nonlinear optics, molecular electronics, electrochemical power sources , Conducting polymers and composites are one of the

major areas of experimental research ever due to the possibility to control electrical conductivity of these films from insulating to metallic by doping. A number of metal and metal oxide particles have been encapsulated into the conductive polymer to form nanocomposites. The incorporation of metal nanoparticles acts as a conductive junction between PANi resulting in an increase in electrical properties of the polyaniline composites [3]. These properties are extremely sensitive to small changes in content, size and shape of the metal nanoparticles incorporated. drugs , sensors and microwave absorbents The fabrication of MO-Polyaniline is particularly of interest because polyaniline (PANI) is one of the most important conducting polymers with high conductivity, ease of synthesis, and good environmental stability .In this paper, we describe the synthesis of PANI and SbO₂ dispersed PANI composite materials through oxidative polymerization of aniline. As prepared PANI and its SbO₂ composite is well characterized by various characterization techniques. a.c conductivity study of the as prepared PANI composite material is also well studied for its conducting behavior [4-10].

2 Preparation of Polyaniline/ Cadmium oxide nanocomposites

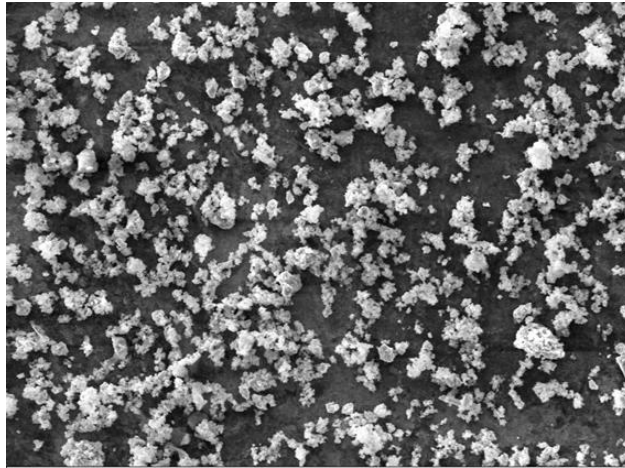
Synthesis of the PANI– CdO nanocomposites was carried out by in-situ polymerization method. Aniline (0.1 M) was mixed in 1 M HCl and stirred for 15 min to form aniline hydrochloride. CdO nanoparticles were added in the mass fraction to the above solution

with vigorous stirring in order to keep the CdO homogeneously suspended in the solution. To this solution, 0.1 M of ammonium persulphate, which acts as an oxidizer was slowly added drop-wise with continuous stirring at 5°C for 4 h to completely polymerize. The precipitate was filtered, washed with deionized water, Acetone, and finally dried in an oven for 24 h to achieve a constant mass. In these way, PANI– CdO nanocomposites containing various weight percentage of CdO (10 %, 20 %, 30 %, 40 %, and 50 %) in PANI were synthesized.

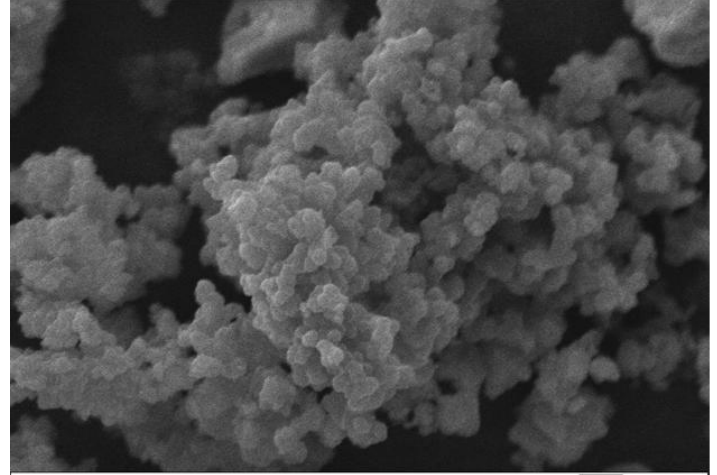
3 Result and Discussion

SEM

Figure shows depict the uniform distribution of spherical shaped CdO into the polymer matrix, respectively. Figure 3(b) shows the incorporation of CdO nanoparticless synthesized into the polymer matrix. SEM analysis of CdO showed a particle size distribution of about 50-70 nm. From the SEM image of composite, it is observed that CdO particles are surrounded by polyaniline matrix and hence it appears as agglomerated macromolecules.

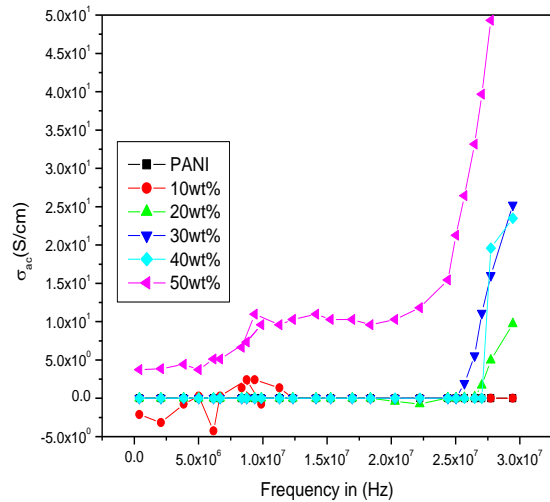


Cdo



cdo /pani nanocomposites

4 AC Conductivity



ac conductivity of the Pani and Pani/CdO nanocomposites

Figure shows the ac conductivity of the Pani and Pani/CdO nanocomposites as a function of the frequency at room temperature. It is found that there is increase in the conductivity of the nanocomposites for the increase in frequency and this pattern is same for all nanocomposites which obeys the universal power law but, at high frequency region, there is an sudden increase in the conductivity with increase in frequency which is the characteristic property of disordered materials

Conclusions

In this study PANI/CdO nanocomposites were successfully synthesized by in-situ polymerization method in the presence of CdO nanoparticles. The results of SEM show the formation of the composite and indicate an interaction between PANI and CdO nanoparticles. The electrical properties of PANI/ CdO nanocomposite are increases with increasing in frequency its because of interaction between metal oxide and PANI. Hence this composite is a promising material for electronic potential and sensing applications.

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