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SYNTHESIS, CHARACTERIZATION AND PROPERTIES oF ZNO-POLYANILINE NANOCOMPOSITE

ZAHARADDEEN MUHAMMAD[I], MISBAHU SAAID AHMAD[1], GEETHA BHAVANI[2]

[1]Department of Chemistry Sule Lamido University Kafin Hausa [2]Noida International University.

ABSTRACT

Chemical precipitation technique and chemical oxidative polymerization of aniline were used to synthesized ZnO nanosize (22 to 37nm) and polyaniline respectively. The ZnO-polyaniline nanocomposite was made by insitu polymerization. X-ray diffraction (XRD) and scanning electron microscopic (SEM) were the techniques employed for the characterization of the nanoparticles. The frequency ranges of 500 to 2000 KHz at different temperature were used to investigate the conductivity and dielectric properties of ZnO-polyaniline nanocomposite. It was observed that the conductivity of ZnO-polyaniline composite increased with temperature and frequency. The conductivity and dielectric constants decrease with higher proportions ZnO polyaniline nanocompiste it was learnt that the interface formed between ZnO particles

Introduction:

Nanomaterials have been extensively studied for application in various kinds of nanoscale functional devices used widely in the chemical industry, medical diagnostics, food technology, ultraviolet testing, national defense and our daily life The main objectives of this research work is to study the properties of nanocomposite, prepare nanosized ZnO, characterized the nanocomposites and prepeare insitu ZnO polyaniline. nanocomposite was prepared by free radical in situ polymerization method and characterized., A series of ZnO doped polyaniline nanocomposite have been prepared by in situ chemical oxidative polymerization at

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and polyaniline causes the decrease of conductivity and dielectric constant in ZnO-polyaniline nanocomposite.

Keywords: Zinc Oxide, Polyaniline, nanocomposite, X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM).

atmospheric pressure and under visible light. The proposed method may be used for the synthesis of ZnO nanocomposites with various conducting polymer. Overall, conducting polymer-sensitized ZnO composites present a promising method for addressing environmental pollution. In thi research, Different proportions of ZnO-polyaniline nanocomposite were synthesized by In situ polymerization technique.

METHODOLOGY

Synthesis of nanosize Zinc Oxide

Nanosize Zinc oxide was synthesized by chemical precipitation method, 10g of zinc sulphate were taken in 200ml of water and stirred till it dissolved completely, by adding excess ammonia solution till complete precipitation. Leave overnight, filter and then washed thoroughly with hot distilled water. The precipitate were heated at 100^0C for 2 hours. Also the precipitate were heated at 400^0C for another two hours. Nanosize ZnO is obtained.

Preparation of Polyaniline and ZnO-Polyaniline Nanocomposite

10ml of aniline solution were taken in a clean beaker and added 40ml of toluene solution. Excess CuSO4 were added solution to the above mixture of solution above. During polymerization about 0.4g of nanosize ZnO is added and stirred with help of magnetic stirrer for one hour, filtered, washed thoroughly with distilled water. Drying at 100^0C in an oven for 5 hours to obtained the 4% ZnO-polyaniline nanocomposite. I repeat the above procedure using 0.8g nanosize ZnO to obtain another proportion of 8% ZnO-polyaniline Nanocomposite.

Characterization; Various techniques have been used to characterize the nanosize ZnO and ZnO-polyaniline nanocomposite. These techniques' include Scanning Electron Microscopy (SEM) and X-Ray Diffraction (XRD).

RESULT

X-ray Analyses

Figure 3.1 represents the X-ray diffraction patterns of nanosize ZnO. The characteristics peaks of ZnO comes at 32.3^0, 34.5^0, 36.2^0, 47.5^0, 57.1, 63.2^0, which corresponds to the standard values as in the literature. The average size of crystal were calculated using scherrer formula by using the full width at half maximum of highest peak at 36.2^0. The average size was found to be 23nm and further confirmed by SEM result.

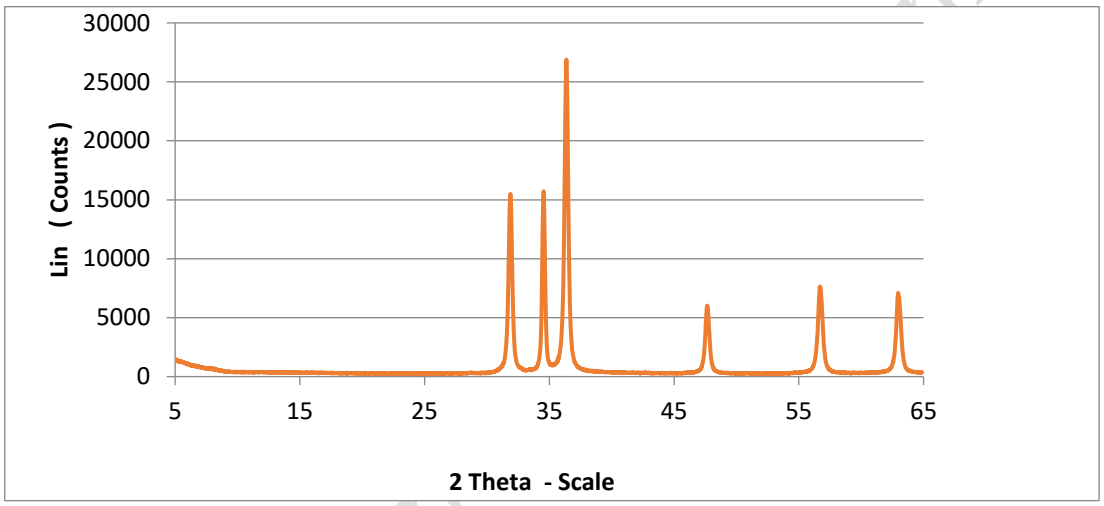

Figure 3.1 XRD patterns of Nanosize Zinc oxide

Dielectric behavior

The behavior of dielectric constant of proportions of ZnO-polyaniline as function of temperatures and frequencies (500 to 2000000 Hz) are shown in figure 4.2. The dielectric of different proportion of ZnO-polyaniline composites revealed decrease of dielectric constant of higher proportions of ZnO-polyaniline composite which is attributed to the interfaces formed between ZnO nanoparticle and polyaniline.

Electrical conductivity

The conductivity as function of temperature and frequencies of ZnO-polyaniline composites increases. The conductivity study of different proportion of ZnO-polyaniline composites revealed decrease of

conductivity of higher proportions of ZnO-polyaniline composite which is attributed to the interfaces formed between ZnO nanoparticle and polyaniline.

SEM and EDX Analysis

The SEM images of nanosized ZnO, ZnO-polyaniline nanocomposite and EDX of the nanocomposite show clarity that the shape of particle is rod, the size of nanosized ZnO lies between 22 to 37 nm in diameter. The bright images show that nanosized ZnO particles are solid structures

CONCLUTIONS

Different proportions of ZnO-polyaniline nanocomposite were synthesized by In situ polymerization technique. The SEM images show that nanosize ZnO are rods in shape and bright images shows that they were solid. The conductivity as function of temperature and frequencies of ZnO-polyaniline composites increase. The conductivity and dielectric study of different proportion of ZnO-polyaniline composites revealed decrease of conductivity and dielectric constant of higher proportions of ZnO-polyaniline composite which is attributed to the interfaces formed between ZnO nanoparticle and polyaniline.

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