IJESM Volume 2, Issue 3 ISSN: 2320-0294

SYNTHESIS AND CHARACTERIZATIONOF PANI/ZnS NANOCOMPOSITES

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ABSTRACT

Nanocomposites of conducting polyaniline (PANI) with ZnS nanoparticles have been prepared by chemical oxidation method using ammonium persulphate as an oxidizing agent. Particle size of synthesized composites of PANI/ZnS are in the range of nanoscale .The prepared material was characterized by XRD. The XRD of sample well matched with JCPDS file available. Incorporation of ZnS nanoparticles in the polymer matrix shows structural rearrangement and enhances crystallinity of the polymer composite as compare to pure PANI so as to used it as thermal conductivity.

Keyword: Polyaniline (PANI), Ammonium Persulphate (APS), Zinc Sulphate (ZnS)

1. INTRODUCTION

The nanocomposites of metal and semiconductor particles have several thermal, optical and electronics application[1].Organic-inorganic nanocomposite with an organized structure has been extensively studied because they combine the advantage of the inorganic material and organic polymers like flexibility dielectric, ductility and processibility, which are different obtained from individual component[2-4].PANI is one of the conducting polymer that has potential in the near term, due to its good processability, environmental stability and reversible control of conducting both the charge discharge doping protonation. Inorganic semiconductor ZnS nanoparticle are most promising compound material is used in various application like sensor,optoelectronic device in solar cell.The word polymer is derived from the Greek word poly- meaning “many” and mars “part”. The term was coined in 1833 by Jones Jacob Berzelius, although his definition of a polymer was quite different from the modern structural units typical connected by covalent chemicals bond. While polymers in popular usage suggest plastic, the term actually refers to a large class of natural and synthetic material with a wide variety of properties [4].

They are complex and giant molecule and are different from low molecular weight

compound [5-10].It essentially the 'graininess' of the size of the polymers molecule that makes its behavior different from that of chemical compound . Another striking difference between the behavior of the polymers and that of low molecular weight compound concerns their solubility pattern [11-14].

A tremendous amount of research has been carried out in the field of conducting polymers since 1977 when the conjugated polymer oxyacetylene was discovered to conduct electricity through halogen doping [15]. The 2000 Nobel prize in chemistry recognized the discovery of conducting polymers and over 25 year of progress in this field. In recent years, there has been growing interest in research on conducting polymer nanostructure [16]. Hence looking at the requirement we have prepared PANI/ZnS Nano composite .

2. Experimental Technique

2.1 Synthesis of PANI Nano composites

Polymerization was carried out by the chemical oxidation of aniline in the presence of H_2SO_4 and APS (Ammonium persulphate) in 100 ml distilled water both played the role as dopant and oxidant respectively. APS was the dopant and oxidant respectively .APS was dissolved in 100ml distilled water in round bottom flask and (0.4 M) H_2SO_4 is also added drop-wise in the solution of APS in H_2SO_4 was then added drop-wise in the solution of aniline with vigorous striring on the magnetic stirrer for 5 hour to initiated the aniline polymerization. A dark green colored PANI suspension was obtained with precipitation. The synthesized of PANI was obtained as finely dispersed particle, which were recovered from the polymerization mixture by centrifugation and washed with deionized water repeatedly until the washing liquid was completely colourless. Finally, the mixture was filtered using filtered assembly. After keeping overnight, the dark gray color precipited was obtained. A precipitate of polyaniline was dried under at 60-80 ^{0}c for more than 8 hour.

2.2 Synthesis of PANI/ZnS Nanocomposites

The synthesis steps of PANI/ZnS Nano composites are similar to the synthesis is method different amount of ZnS was dispersed into the APS solution and stirred for hour prior to the addition of aniline. Aniline (0.4 M) stirred drop-wised using burette into thr APS-ZnS solution stirred vigorously to form homogenous dispersion. For weight percentage of ZnS 5% and same condition were maintained for all composites as that of pure PANI to compare the result.

Result and discussion

The XRD technique is used for structural determination and confirmation of the material Fig shows the XRD spectra of pure PANI and pure PANI/ZnS nanocomposite. The XRD pattern of pure PANI and PANI/ZnS are matchable with the JCPDS file. X-ray diffraction pattern of the composites shows the presence of few reflections in the polymers from X-ray spectra it has been concluded that the polymer is polycrystalline. There is change in crystallanity due to incorporation of ZnS in PANI.

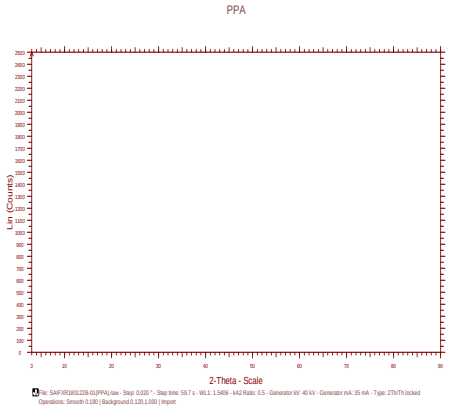

Fig. 3.1 XRD of Pure PANI

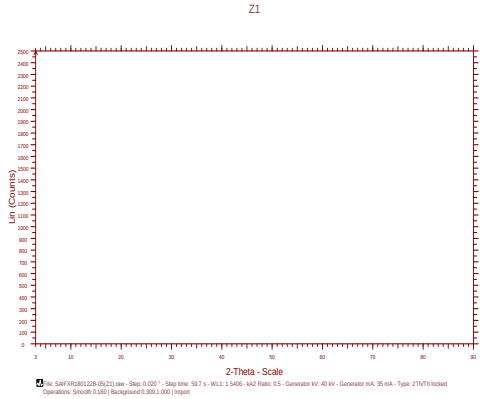

Fig. 3.2 XRD of PANI/ZnS

Conclusion

Polyaniline-coated Zinc sulphate and pure polyaniline supplied nanocomposites have been synthesized via chemical oxidation technique. The XRD study revealed the increased in the degree of crystallity of nanocomposite. Hence the material have been futher studied for optical and electronic properties. It observed that there material synthesized by chemical oxidation method, can be used for d.c /a.c conductivity

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