

Synthesis and Characteristics of In_2O_3 Doped Polyaniline Nano Composites

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ABSTRACT

In this paper, Indium oxide nano particles were prepared by chemical oxidation method. In this synthesized using ammonium persulphate $[(\text{NH}_4)_2\text{S}_2\text{O}_8]$ as an oxidant. The PANi- In_2O_3 samples are prepared with 5 and 10 wt%. The structural changes of prepared composite materials were carried out by X-ray diffraction (XRD) tool.

Keywords : PANi, In_2O_3 , XRD

I. INTRODUCTION

It is the new approach on conducting polymer composite materials compose the technology of conducting polymeric materials. Polymer composite is the inserted the metal oxide, which are studies for its properties [1-3]. The first generation of conducting polymer have a applications in various fields, like Industry, scientific and medical fields. Second generation of electric polymers have applications such as transistors, LEDs, solar cell batteries. These materials attractive in the engineering and scientific world due to controlled conductivity, high temperature resistance, low cost and ease of bulk preparation make. Polyaniline is most extensively studied polymer obtained by simple chemical or electrochemical route among the conducting polymer. The polyaniline have its high electrical conductivity and ease of preparation at low cost. Many researchers have interest to metal oxides dispersed polymer composite because they frequently exhibit unexpected hybrid properties

synergistically derived from both components. One of the oxide material are Indium oxide which have progressive properties and applications [4]. Composite of indium oxide with PANi lead to desirable properties and new applications. These materials are important owing to their important role between the worlds of conducting polymers [5]. Indium oxide which shows good electrical and optical properties [6-7]. The very high surface to volume ratio of indium oxide can be facilitate new and novel applications. Indium oxide (In_2O_3) material has recently attracted much attention due to its controversial basic material properties [8]. It has a wide band gap (3.4-3.7) eV [9,10], and is a suitable for the fabrication of various devices such as field effect transistors, light emitting diodes, barrier layer in tunnel junctions[11-13], transparent conducting material in liquid crystal displays[14], photovoltaic and solar cells[9] as well as a sensing material in a gas sensors[15,16]. In this paper, we follow the polymerization method for synthesis of PANi and indium oxide (In_2O_3).

II. EXPERIMENTAL METHOD

2.1. Synthesis of Polyaniline (PAni)-Indium Oxide(In_2O_3):

1.1 M aniline hydrochloride dissolved in distilled water. Indium oxide was added in the weight percent of 5 and 10 to the above solution with vigorous stirring in order to keep the indium oxide suspended in the solution. 0.1M of ammonium persulphate $[(\text{NH}_4)_2\text{S}_2\text{O}_8]$ as an oxidant was added slowly to the reaction mixture with continuous stirring for 4-6 hours at $0-5^\circ\text{C}$. The precipitated powder recover was vacuum-filtered and washed with deionizer water. Finally, the resultant precipitate was dried in an oven for 24 hours to achieve a constant weight. Similarly five different PAni- In_2O_3 composites with different weight of In_2O_3 (5 and 10) in PAni have been synthesized.

III. RESULTS AND DISCUSSION

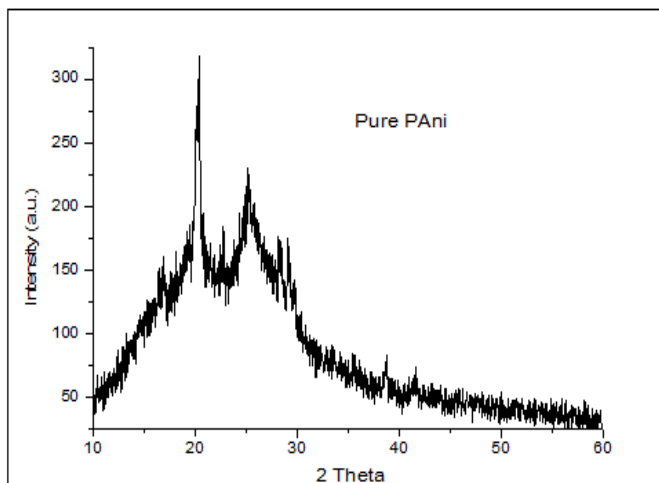


Fig. 1(a) X-rd of Pure Polyaniline

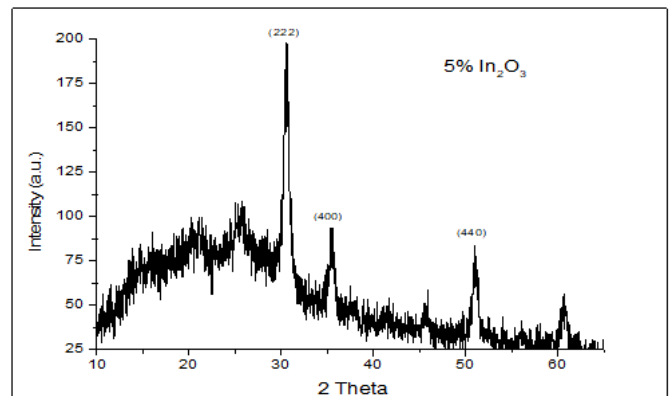


Fig. 1(b) X-rd of 5wt% of PAni- In_2O_3 Nano Composites

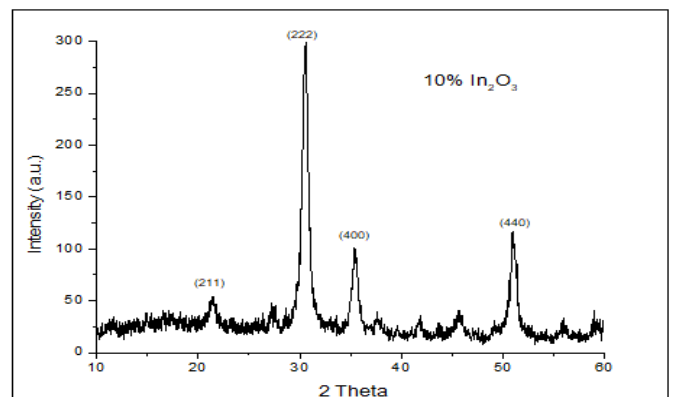


Fig. 1(c) X-rd of 10 wt% of PAni- In_2O_3 Nano Composites

The X-Ray powder diffraction were recorded using Rigaku Miniflex-600 diffracto meter using $\text{CuK}\alpha$ having wave length $\lambda = 1.5406 \text{ \AA}$. X-Ray diffraction is a high-tech, nondestructive technique for analyzing a wide range of materials.

Fig. 1(a) shows the X-ray diffraction pattern of polyaniline. analysis of X-ray diffraction of polyaniline suggest that it has amorphous nature with broad peaks. Fig. 1(b & c) shows the X-ray diffraction pattern of 5 and 10 wt% of PAni- In_2O_3 nano composites. The sharper and stronger diffraction peaks in PAni- In_2O_3 nano particles curves show that the In_2O_3 nano particles have a high degree of crystallization. The diffraction peaks agree with those given in JCPD data card of bulk cubic In_2O_3 reflections from (211), (222), (400) and

(440) planes. This oxide peaks in the composite pattern confirms the formation of Indium oxide dispersed polyaniline composite.

IV. CONCLUSION

The chemical oxidation method was used for preparation of PANi-In₂O₃ nano composites. This method may be used for the preparation of PANi nano composites with various metal oxide materials. Structure changes of pure PANi and PANi-In₂O₃ is observed by XRD pattern.

V. REFERENCES

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