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STUDIES ON CONDUCTING POLYMER COMPOSITES FOR FOR ENERGY STORAGE DEVICES

Asiya Masarat[1],Jakeer Husain[2]
[1]Dept of Applied Physics Faculty of Engineering & Technology ,KBNU, Kalaburagi, Karnataka
[2]Assistant Prof Dept of Applied Physics Faculty of Engineering & Technology ,KBNU, Kalaburagi, Karnataka

ABSTRACT
Polymer composites were synthesized by chemical oxidative polymerization technique using monomer aniline and ammonium persulphate as an oxidant. The prepared composite were characterized by Scanning electron microscopy (SEM), And also we study on the performance of a room temperature LPG gas sensor based on polymer composites and there electrical properties.
Keywords: GAS,DC,SEM,Chemical,Energy

1 INTRODUCTION

Conducting polymer is the most widely studied due to its several properties [1,2]. It ease to synthesis , low density, less cost, better electronic, optical properties, highly stable in air and soluble in various solvents, and good processibility [1].Thus the synthesis of novel conducting polymers and study of their physical properties has been of prime importance. Aqueous electrochemical process in an environmentally friendly and efficient technique used to process conducting polymer. It is widely preferred because of its simplicity and it can be used as a one step method
to form polymer. It allows efficient control of the physiochemical properties of the coatings and it can also be easily scaled up for large scale production [2-4]. Conductive polymers had been the topic of the large number of investigations during last decades because of their unique properties such as mechanical strength, electrical conductivity, corrosion, stability and possibility of both oxidative and electrochemical synthesis. Hence PANI is useful in wide area of application[5-6]
In the present investigations attempts were made to report on synthesis of PANI composite by chemical oxidative method the synthesized compound is characterized by Scanning electron microscopy (SEM).

2 Experimental

Synthesis of the PANI/ V_2O_5 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. V_2O_5 nanoparticles were added in the mass fraction to the above solution with vigorous stirring in order to keep the V_2O_5 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–V_2O_5 nanocomposites containing various weight percentages of V_2O_5 (10 %, 20 %, 30 %, 40 %, and 50 %) in PANI were synthesized.

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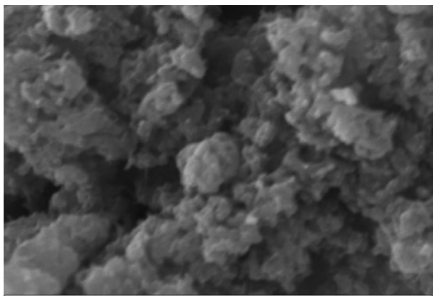
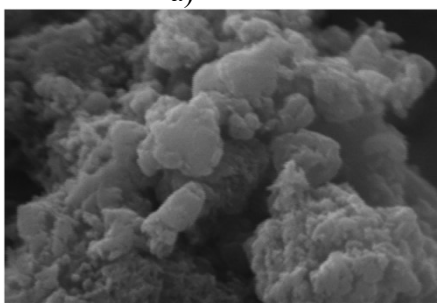
3 Results and Discussion

3.1 Scanning Electron Microscopy

Figure 3.1 (a)&(b) shows the Scanning Electronic Micrograph image of pure PANI and Polyaniline V_2O_5 nanocomposites. figure shows the pure V_2O_5 paricle shows uniform sphere-like shape.



a)



b)

4 Sensing Studies

Figure 4 shows the variation of Sensitivity with time for PANI/V_2O_5 nanocomposite containing:10wt%, 20wt%, 30wt%, 40 wt % 50wt% V_2O_5 particles.The Sensitivty of the nanocomposite was measured at room temperature when expose to LPG vapors the Sensitivty of all pani nanocomposite samples increses with increasing the weight percentage of V_2O_5 nanoparticle increase in sensitivity can be the increase in V_2O_5 adsorption capacity of the contact zone between the charged particles of pani and V_2O_5 nanoparticles.the increasing sensitivity at higher weight percentage may be due to high surface area with possible reaction sites of the nanocomposites due to adsorption of gas molecules .

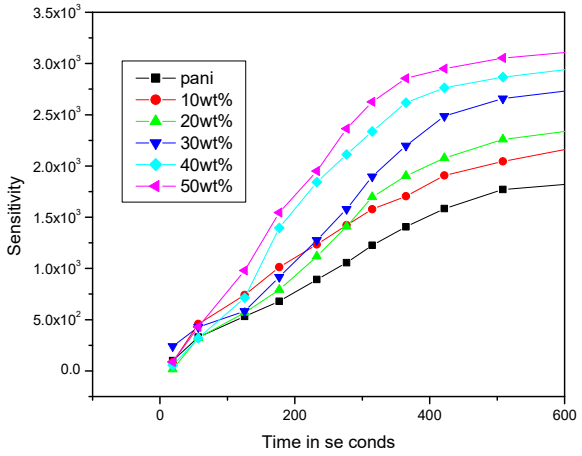


Figure 4 shows the variation of Sensitivity with time for PANI/V_2O_5 nanocomposite

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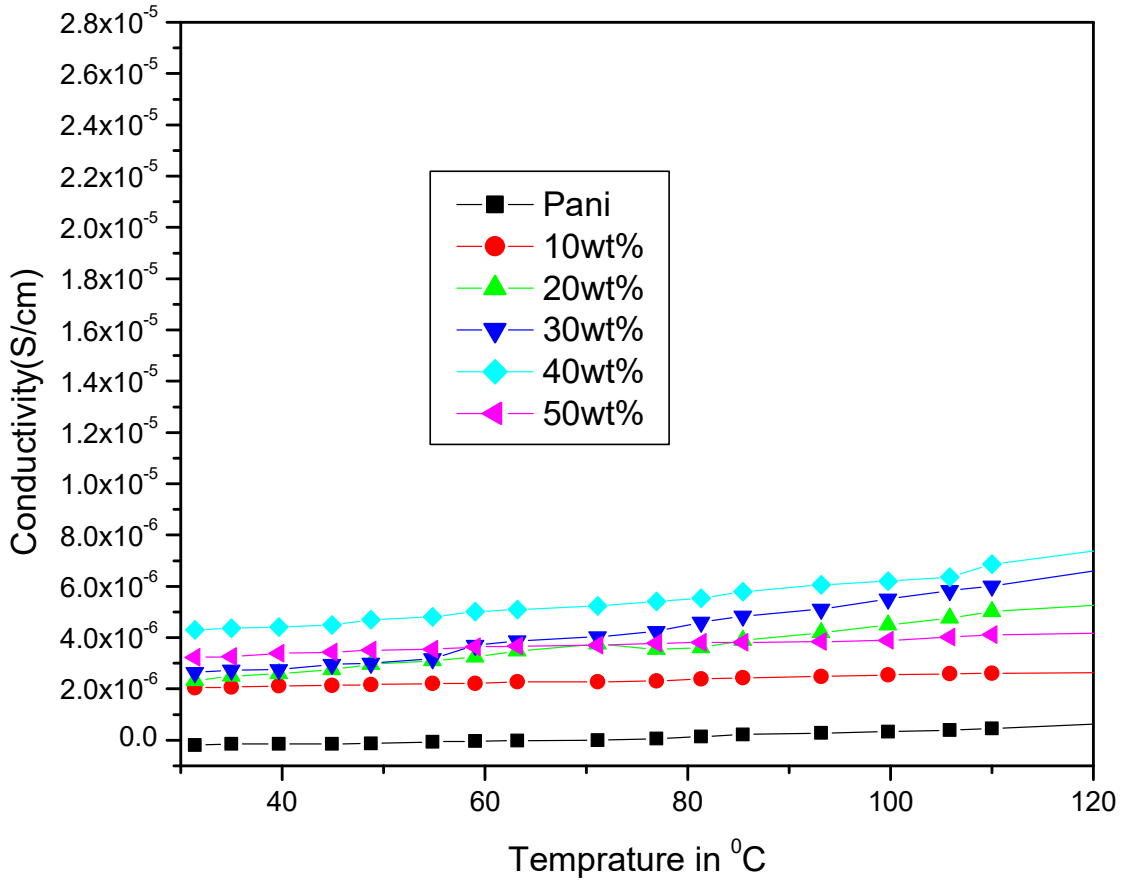
5 DC CONDUCTIVITY

Figure 5 shows the dc conductivity of Pani, Pani/V_2O_5 nanocomposites as a function of temperature which varies from 40 to160^{0}c. The conductivity values are almost constant up to 80^{o}c and after it increases steadily up to 160^{o}c, which shows the semiconducting material behavior. At higher temperature, conductivity increases because of hoping of charge carriers (polarans) from one localized state to another localized state. The increase in dc conductivity as a function of temperature of the PANI/ V_2O_5 nanocomposites at different weight percentages. The conductivity increases with an increase in temperatures due to the flow of ions from one localized state to another and It is also suggested here that the thermal curling effects of the chain alignment of the Polyaniline leads to the increase in conjugation length and that brings about the increase of conductivity.



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gure 5 shows the dc conductivity of Pani, Pani/V_2O_5 nanocomposites

CONCLUSIONS

In this study PANI/V_2O_5 nanocomposites were successfully synthesized by in-situ polymerization method in the presence of V_2O_5 nanoparticles.The results of SEM show the formation of the nanocomposite and indicate an interaction between PANI and V_2O_5nanoparticles. The maximum Sensitivity and conductivity is observed for 50wt% of V_2O_5 nanocomposite.

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