

ELECTRICAL CONDUCTION OF POLYANILINE DOPED PVC-PS BLEND

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Abstract:

The poly blend of PVC and PS in the weight ratio 5:1 were prepared by using 1.25 g of PVC and 0.25 g of PS. PANI has been used as a dopant with 0.5% of total weight of two polymers.

Electrical conductivity of poly aniline doped PVC-PS blend has been measured by studying the I-V characteristics at various temperature in the range 313-353 K.

KEYWORDS : Electrical conductivity, PANI, PVC, PS

1. Introduction:

Bio electrate state is a universal property of biomolecule. Biomolecule interact in a kind of molecular game of logic. Physical properties of them participate in their dynamics, self sustaining transformation of energy and matter[1]. Belsare and Devgaonkar have explained the electrical conductivity of iodine doped polyblend films of polystyrene and poly methyl methacrylate [2]. Mishra and Nath reported DC electrical conductivity of glycine to study the mechanism of electrical conduction [3]. By using poly electric response for electromagnetic radiation detection, polymer electrate work have been published[4,5]. R S Gulalkari reported electrical conduction mechanism of PVC-PMMA blend film[6]. V S Sangawar studied dielectric and other properties of doped thin film polystyrene and polymethyl methacrylate thermoelectrate[7].

In the present paper DC conductivity of polyaniline doped PVC-PS blend was measured to study the electrical conduction mechanism.

2.Experimental Details:

2.1 Preparation of sample

The polyvinyl chloride (PVC) and polysterene (PS) of standard grade product supplied by Polychem Industries, Mumbai. The conducting polymer (polyaniline) was prepared by chemical oxidation using ferric chloride by conventional procedure.

For the preparation of polyaniline doped thin films, the two polymers PVC (1.25g) and PS (0.25g) were taken in the ratio 5:1 by weight. 1.25 g of PVC in 15 ml Tetrahydrofuran (THF) and 0.25 g of PS in 10 ml of THF dissolved seperately and subsequently mixed together. Polyaniline was taken in 2.5 wt % and was dissolved in 5 ml of THF to produce Polyaniline solution.

After allowing them to dissolve completely, the three solutions were mixed together. The solution was heated at 60⁰ c for two hours to allow polymers to dissolve completely to yield a clear solution. A glass plate (15 x 15 cm) thoroughly cleaned with hot water and then with acetone, was used as a substrate.

To achieve perfect levelling and uniformity in the thickness of the film, a pool of mercury was used in a plastic tray in which the glass plate was freely suspended. The solution was poured on the glass plate and allowed to spread uniformly in all directions on the substrate. The whole assembly was placed in a dust free chamber maintained at a constant temperature(40⁰C). In this way, the film was prepared by isothermal evaporation technique .The film was subjected to 12 hours heating at constant temperature of 50⁰C and for another 12 hours at room temperature to remove traces of solvent. Finally, the film was removed from the glass plate, it was cut

into small pieces of suitable size which were washed with ethyl alcohol to remove the surface impurities.

2.2 Thickness measurements

For measuring the thickness, micrometer screw gauge with least count 0.001cm (10m) was used. But for greater accuracy and resolution, a compound microscope in conjunction with an acculometer which gives least count, 1.3m and 3.3m, at the magnification of 1:10 and 1:100 respectively was used. A small section of the sample was taken mounted vertically to get a clear section of view of the thickness. The film used for the present study was of the thickness 70 μ m.

3. Result and discussion:

The log I-log V plot of polyaniline doped PVC-PS blend at temperatures 313K,323K,333K,343K and 353K are shown in figure 1. The current increases non-linearly with the applied voltage and does not follow power law $I = kV^m$, Where k and m are constants. The current in the beginning at low value of voltages increases at a faster rate while it is being slowed down at higher values of voltages .

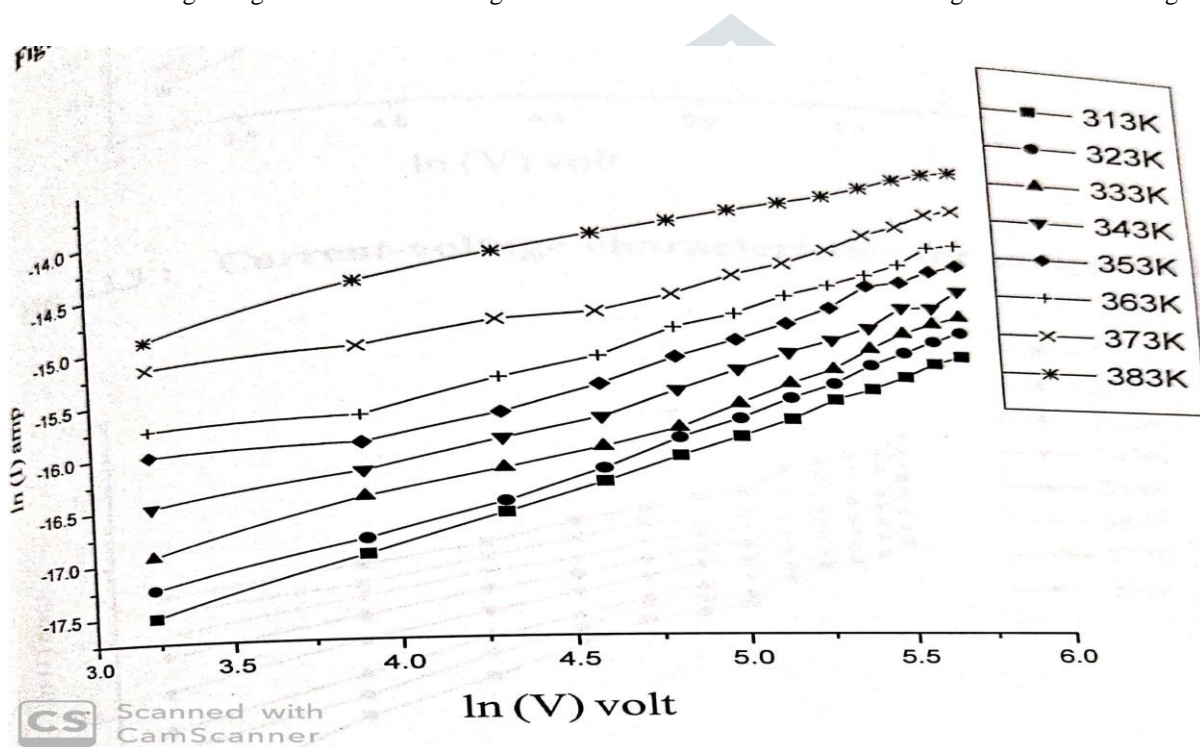


Fig.1 Plot of the log I-log V plot of polyaniline doped PVC-PS blend

Conclusion:

It appears that mechanism of electrical conduction is a cooperative process here with

- (i) Current at constant temperature increases with applied voltages.
- (ii) Current at constant applied voltage increases with temperature.

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