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Performance Analysis of Electret for Microelectronics Applications

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***Abstract*-Nature of the Electret depends upon the intermolecular properties of the material. Polyvinyl carbazole and malachite green produces excellent results for smart technology. Performance analysis is studied for energy and environment in this case. PVK doped malachite green sensitized samples represents characteristics peaks and vibrations of pairs or small groups of atoms in the molecules.**

Keywords: PVK, band gap, UV, CTC, Microelectronics.

1. INTRODUCTION

The major developments in Electronics engineering have been studied. The structure of polymers and their thermo-electrical properties. In recent times, the ability to manufacture polymers has been developed, although there is still much more to be learnt about "tailor made" polymers. Mankind since time immemorial has been in look out for new materials. Polymers, though introduced in the beginning of 19^{th} century, still play a major role in our modern living [1-5]. Since, the formation of the earth over 4 billion years ago, in its giant laboratory of "nature", simple elements combined to form complex molecules and polymers. Such a combination triggered off the most intriguing and fascinating process called life. The material basis for life origin was a polymer [6-11].

2. EXPERIMENTS CONDUCTED

For carrying out all the experimental studies, thin films of pure and malachite green (MG) doped polyvinyl carbazole (PVK) were deposited by solution cast technique.

Polyvinyl carbazole (PVK) is a transparent thermoplastic material, with good thermal and chemical stability and photorefractive material. For comparative study and to observe the effect of doping in pure PVK matrix malachite green is used in present investigation [12-15].

3. RESULTS AND DISCUSSION

To determine the mechanism responsible for polarization, thermally stimulated depolarization currents (TSDC) in short circuit configuration, transient current in charging and discharging modes, electrical conduction, dielectric studies and spectroscopic studies were performed. The experimental conditions under which the thermally stimulated discharge currents and other studies were measured are summarised below -

Polarizing field strength- 250, 400, 550 and 700 V. Polymers are generally good dielectrics which can store charge in them permanently, when subjected to field-temperature treatment and are known as thermoelectrets. When such thermoelectrets are subjected to a

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programmed heat treatment, they give rise to a current in the external circuit which is known as TSDC. TSDC is an accurate, sensitive and convenient method for studied the charging as well as discharging processes in dielectrics. These currents are due to the dielectric relaxation behavior and motion of free charges in the polymers. Hence, TSDC technique is used for learned the low frequency dielectric behavior and relaxation processes on the atomic scale. Because of the high sensitivity of the technique, it is also used to investigate the low concentration of the dipolar impurities, formation and aggregation of impurity-vacancy complexes, phase transitions, photographic response of silver halide, etc.Temperature variation is shown in figures 1 to 4. It is clear that peak current is increasing.

TSDC spectra for pure and malachite green PVK samples polarized with different field strength and at different fixed temperatures consist of one broad peak along with a small magnitude peak. TSDC characteristics of PVK films have also been recorded as a function of polarizing temperature under identical conditions of polarization. It has been found that the peak current increases and the peak shifts towards the lower temperature with increasing polarizing temperatures for a given polarizing field strength [15-21].

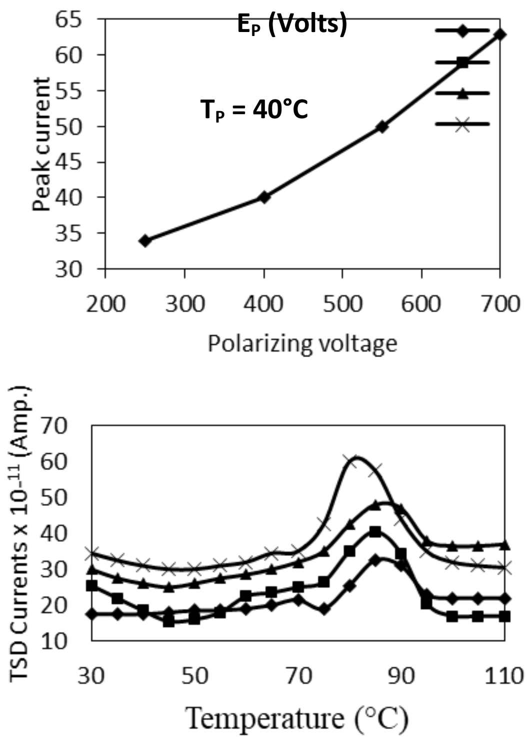

Figure 1: TSDC thermo grame of pure PVK samples poled at 40°C with different polarizing fields (i.e. 250, 400, 550 and 700 volts).

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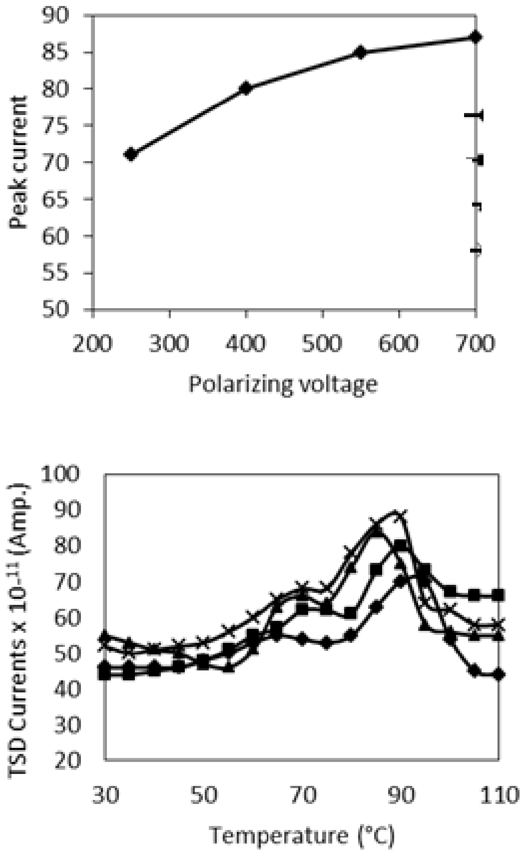

Figure 2: TSDC thermograms of pure PVK samples poled at 60°C with different polarizing fields (i.e. 250, 400, 550 and 700 volts).

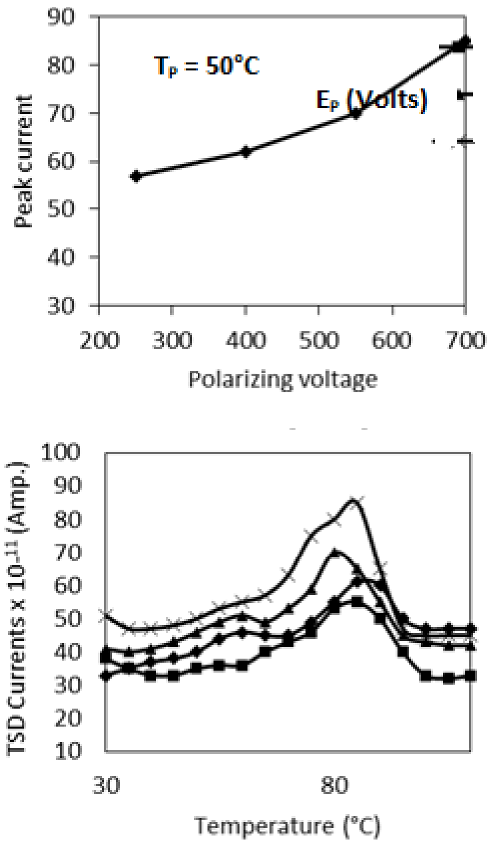

Figure 3: TSDC thermograms of pure PVK samples poled at 50°C with different polarizing fields (i.e. 250, 400, 550 and 700 volts).

In order to understand the mechanism responsible for TSDC, the spectra were analysed on the basis of existing theories. The activation energies corresponding to peaks are calculated by the initial rise method. Plots of initial part of the peaks are used to calculate the activation energies. The relaxation times and the charge released are computed by integrating the area under the TSDC peaks. In this way it is clear that electret play dominant role for charge storage and also covers environmental aspects [22-30]..

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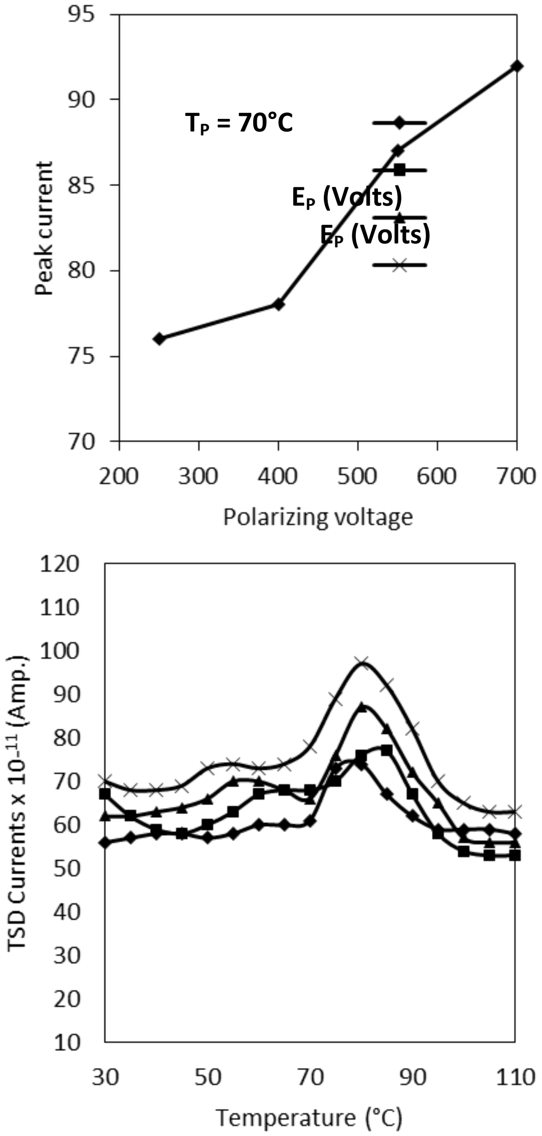

Figure 4: TSDC thermograms of pure PVK samples poled at 70°C with different polarizing fields (i.e. 250, 400, 550 and 700 volts).

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