

Study of the optical absorption edge and optical constants of poly alpha naphthyle acrylate thin films

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Abstract— Optical properties of poly alpha naphthyle acrylate thin films was deposited on glass substrate at room temperature by using cast method technique. The films properties investigated include their transmittance, reflectance spectra, absorbance spectra, extinction coefficient, optical conductivity and complex dielectric constant. The optical constants such as refractive index n the dispersion energy E_d the oscillation energy E_0 the light frequency dielectric constant ϵ_∞ and energy band gap E_g have been determined by reflection spectra in the wavelength range (200-1100) nm.

Index Terms— PNA polymer, Absorption coefficient, Optical Conductivity, Complex dielectric constant

I. INTRODUCTION

Amongst the new classes of materials, polymers are especially interesting because they combine the optical and electronic properties of semiconductors with the processing advantages and mechanical properties of polymers [1].

Semi conducting polymeric mixtures take a large area in different applications such as heating prevention of static electricity accumulation such as preventing dust attraction on electronic device cabinets and electrodes and used for electromagnanetic interference shielding of electronic devices and prevention of static electricity hazards in the handling of electronic chips and explosives[2,3].

Optical properties such as refractive indices for certain range of wavelength between ultraviolet and near infrared and optical band gap values becoming quite important criteria for the selection of application of the fabricated films. The refractive indices of optical materials are considerable importance for applications in integrated optic devices such as switches [4].

Many applications require the materials in thin form. Microscopic defect, which control surface smoothens and coating homogeneity, contribute to the scattering of light and associated degradation of the optical response. Similarly, structural disturbance at the atomic level can alter the optical properties through modifications to the complex refractive index of the material [5,6].

In the present study the optical properties of poly alpha naphthyle acrylate thin film in the wavelength (200-1100) nm.

The study included measurement of optical spectra, reflectivity, absorption coefficient, refractive index, optical

band gap, optical dispersion parameter, loss function, and complex dielectric constant.

II. EXPERIMENTAL PROCEDURE

Poly alpha naphthyle acrylate was synthesized and condensation polymerization adopting method previously reported [7]. Fig. 1 show the expected structure of the polymer under the present study.

0.1 M of polymer (0.1081) gm is first dissolved in Dimethyle Formamide (DMF) and stirred at room temperature for (4-6) h. The stirred solution was cast on the glass substrates cited horizontally to get a homogeneous thickness. The film was prepared onto a standard glass microscope slide with dimensions of $2.2 \times 2.2 \times 0.12$ cm by the spin- coating method and dried at room temperature (RT) for (10 min). The solvent is allowed to evaporate slowly at room temperature. Current process was applied to the samples as a final process via increasing the temperature in the rate 10°C/hr up to 90°C , then cooled gradually up to the room temperature. The thickness of the film is about $4\ \mu\text{m}$.

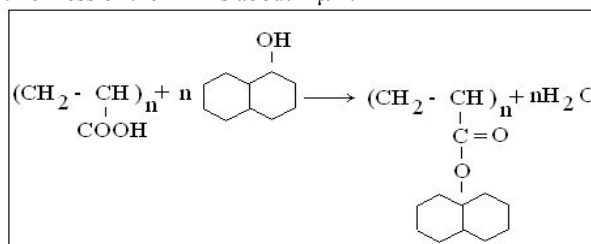


Fig.1. The chemical structure of polymer

III. RESULTS AND DISCUSSION

UV-Vis spectroscopy has been used to characterize the poly alpha naphthyle acrylate thin film in the spectral range (200–1100 nm). The absorbance, A , transmittance, T , and reflectance R , of poly alpha naphthyle acrylate film measurements were carried out using Cecil ReflectaScan CE 3055 Reflectance Spectrometer. These measurements were performed at room temperature. Figure 2 shows the spectral distribution of absorbance for poly alpha naphthyle acrylate film in the spectral range (200–1100 nm).

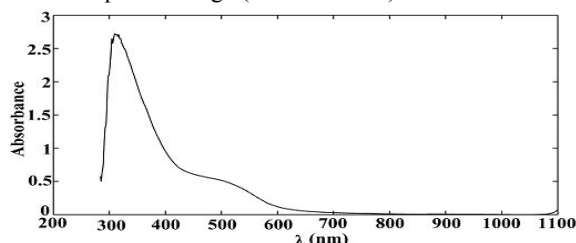


Fig.2. Spectral absorption vis. λ of poly alpha naphthyle acrylate thin film.

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