Institute of Physics Publishing Journal of Physics: Conference Series **28** (2006) 139–142
doi:10.1088/1742-6596/28/1/030 International Conference on Materials for Advanced Technologies, Symposium Y

Structural Analysis of Spiropyran Polimers using ATR Spectroscopy

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Abstract. We have used infrared spectroscopy in attenuated total reflection (ATR) mode to analyze the interactions between the polymeric base and solvent with a photochromic material (spyropiran). We used cellulose acetate as polymeric base and the spyropiran; 1,3,3 trimethyl indoline-5-nitro benzopyrane. Thin films with different weight concentrations of SP were deposited in the polymeric base. The infrared spectra show bands whose frequencies are associated to several molecular bondings. It was observed a decreasing in intensity of absorbance for C=O stretching mode of the acetate group at 1720 cm^{-1} and for C=C stretching mode for the main chain at 823 and 982 cm^{-1} both associated to the presence of SP in polymeric films.

1. Introduction

Spiropyran (SP), have a great potential for applications in optical devices, for example as data storage films and waveguides[1,2], principally because of their physical and chemical properties would be controlled by laser illumination. In general, SP absorbs in the ultra violet (UV) region and not in the visible region. Upon UV illumination, the SP colorless isomer undergoes heterolytic cleavage of the NO bond to form the colored isomer (merocyanine). The coloration change (colorless to blue) in the sample is the physical observation of the molecular transformation. This process can be reversed by visible illumination. Figure 1 shows this process, the cis-cisoid isomer is an intermediate process in this molecular transformation and it is associated to sample degradation[3].

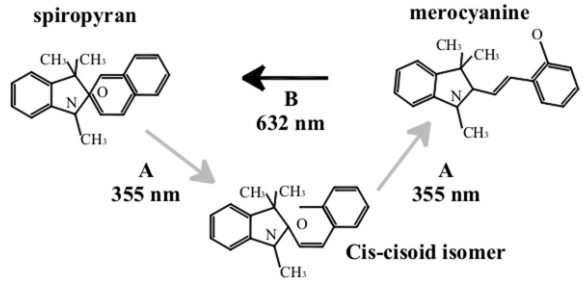

Figure 1. Schematic molecular structure of the sample before UV illumination (i.e. λ = 355 nm) and after isomerization. The process is reversible under visible illumination (i.e. λ = 633 nm). The X isomer is an intermediate process in the conversion cycle between spiropyran to merocyanine.

The radical group NO would be change to obtain different absorption peaks for the merocyanine state. The principal features of these materials are the several cycles of convertion and reconvertion process that could be done. Otherwise each cycle generate a decreasing in the optical properties of the sample.