

CHAPTER - I

INTRODUCTION

I N T R O D U C T I O N

Luminescence from 'polymers' in dilute rigid glasses and solid polymer films are subjects of extensive current research. The interest shows partly from the vast differences in optical and electronic properties which polymers exhibit and their usefulness. Luminescence spectroscopy is a powerful technique for the study of polymer structure and mobility. The molecular environment on the other hand will have the effect on electronically excited states of chromophores. The luminescence spectroscopy can be a valuable tool for identifying the products formed in thermal or photochemical degradation. Polymer photophysics is a field of growing interest. Further the emergence of conducting polymers as a new class of semi-conducting materials has generated a considerable interest from the point of view of using these materials in the Photoelectrochemical Solar Cells (PESC).

The behaviour of irradiated polymeric materials has been the subject of countless research activities around the world. In case of many organic compounds, special fluorescent properties appear to be attendant with given structures. Emission of light can be employed for the characterization and structural elucidation of molecules. The study of emission provides valuable information on the excited states of molecules and on the mechanism of energy transfer between molecules or among different states of the same molecule .

Molecules consisting of more than one aromatic ring system separated by alkyl chains or carbon-carbon single bonds frequently exhibit unusual fluorescence spectra.

Generally, the fluorescence process will tend to be favoured if a compound has the following properties like (a) a longest wavelength of absorption with a high extinction coefficient in the ultra-violet or visible region corresponding to a $\pi \longrightarrow \pi^*$ excitation. (b) The excited singlet state should be relatively stable to the deactivator of processes i.e. it should have a half life of about 10^{-8} s. (c) Fluorescent properties are often very sensitive to slight structural modifications. The structural requirements for the fluorescence of an organic compound are dependent on three main factors, the nature of the carbon skeleton, the geometrical arrangement of the molecule and the type and position of any substituents.

A large number of coumarins occur as natural products and have also been synthesized. Many of them are intensely fluorescent and possess physiological activity. Because of analytical and biological importance the study of fluorescence properties of coumarins has assumed importance.

The fluorescence spectra have been recorded and presented for the discussion for 7,8-dihydroxy-4-methyl coumarin (a monomer A) and its co-polymers A_1 , A_2 , A_3 , A_4 and A_5 .

The specimens chosen for the present study are :

- (1) A_1 Copolymer of 7,8-dihydroxy-4-methyl coumarin with Sebacic Acid.
- (2) A_2 Copolymer of 7,8-dihydroxy-4-methyl coumarin with Maleic Acid.
- (3) A_3 Copolymer of 7,8-dihydroxy-4-methyl coumarin with Phthalic Acid.
- (4) A_4 Copolymer of 7,8-dihydroxy-4-methyl coumarin with Iso-phthalic Acid.
- (5) A_5 Copolymer of 7,8-dihydroxy-4-methyl coumarin with Terephthalic Acid.

The emission spectra have been presented for discussion for the above specimens under various conditions, such as in the as received conditions, after mechanical deformation and after the thermal treatment. The emission spectra have been explained on the basis of the electronic transitions also.

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