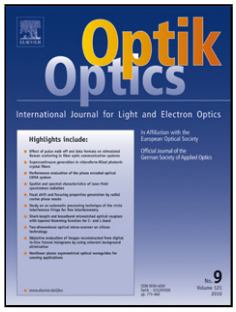

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Characterization of the physical properties of azo merocyanine dyes in different solvents and concentrations

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Abstract

The physical properties of five different samples of azo merocyanine dyes, each dissolved in three different polar solvents (Acetonitrile, Ethanol and 1-propanol) with three different concentrations (3×10^{-5}, 2×10^{-5} and 1×10^{-5} mol/L) have been measured experimentally. The refractive indices of the samples have been determined with an accuracy of $\pm 1 \times 10^{-4}$ by using an Abbe Refractometer of measuring range from 1.300 to 1.700. The measurements have been performed at four different wavelengths (435.8, 546.1, 578.0 and 589.3 nm). Other parameters such as Cauchy's dispersion constants, resonance wavelength, molar polarizability, molar refractivity, absorption index and abbe number have been calculated. Also, viscosity, thermal expansivity and the effect of temperature on refractive index have been investigated. The intermolecular interactions between the solute and the solvent have been discussed. The physical characterization of merocyanine dyes provides valuable and important information needed for using them in many applications.

Keywords: **Merocyanine dyes used for data storage and solid state devices, refractive index and its dispersion, thermo-optic coefficient, Viscosity and thermal expansivity.**

1 Introduction

Merocyanine dyes (MC) are considered an important type of cyanine dyes. Their physical properties are highly sensitive to the changes in environmental factors, such as solvent polarity, temperature, light, and acid dissociation constant (pH value) [1]. They are used in many applications in scientific fields and technology because they are prepared by easy synthetic methods, have high fluorescence and visible/UV absorption. Also, they have photo electrochemical properties [2]. Due to energy- and electron-transfer reactions in photochemistry, they are used for the advanced functional organic materials for electronics and photonics [3]. Because of their high voltage sensitivity, they are used as an electrochromic molecular probe for monitoring membrane potentials in biological systems. Also, they are used as neuronal activity for a single neuron in neurophysiology [4]. As the structure shows intrinsic charge asymmetry, their molecules exhibit the highest molecular hyperpolarizability value in nonlinear optics [5]. Applications of this phenomenon are shown in liquid crystal [6] and laser doublers. They are used as photosensitizers for