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SYNTHESIS AND STUDY OF NONLINEAR OPTICAL PROPERTIES OF A NEW AZO DYE BY Z-SCAN TECHNIQUE

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ABSTRACT

The single beam Z-scan technique was used to determine the nonlinear optical properties of the new azo dye [4-(2-hydroxy naphthylazo)phenyl][2-(2-methoxy benzylideneamino)-5-methylphenyl] tellurium dibromide dye in the solvent chloroform and a dye doped polymer film. The experiments were performed using cw SDL laser with a wavelength of 532 nm. This material exhibits a negative optical nonlinearity. The dye exhibited a nonlinear refractive index (and cm2/W in dye solution and polymer film, respectively), nonlinear absorption coefficient (and cm/W in dye solution and polymer film, respectively).Optical limiting characteristics of the dye solution and polymer film were studied. The result reveals that [4-(2-hydroxy naphthylazo)phenyl] [2-(2-methoxy benzylideneamino)-5-methylphenyl] tellurium dibromide dye can be a promising material for optical limiting applications.

KEY WORDS: Nonlinear optics, nonlinear refractive index, Z-scan technique, optical limiting.

INTRODUCTION

The field of nonlinear optics (NLO) has been developing for a few decades as a promising field with important applications in the domain of photoelectronics and photonics [1,2]. NLO materials can be used to manipulate optical signals in telecommunication systems and other optical signal processing applications [3,4]. Organic materials are considered as one of the important classes of third-order NLO materials because they exhibit large and fast nonlinearities and are, in general, easy to process and integrated into optical devices [5-7]. Moreover, a fine-tuning of the NLO properties of organic compounds can be achieved by rational modification of the chemical structure [8]. Various types of organic compounds have been studied to obtain materials with large third-order nonlinearity. On the other hand a wide range of techniques have been used to measure third-order nonlinearity: e.g. Z-scan [9,10], nonlinear interferometry [11], degenerate fourwave mixing [12], nearly degenerate three-wave mixing[13], ellipse rotation [14], beam distortion measurements [15], optical third harmonic generation (THG) [16] and frequency resolved optical gating [17].