Measurement of the thermo-optic coefficient and Ring surface profile of sulfadiazine azo dye by using milli watts cw laser beams

To cite this article: R. K. Fakher Alfahed *et al* 2020 *IOP Conf. Ser.: Mater. Sci. Eng.* **928** 072071

Measurement of the thermo-optic coefficient and Ring surface profile of sulfadiazine azo dye by using milli watts cw laser beams

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Abstract
We report on the observation of thermal lens as well as multiple diffraction ring patterns due to the irradiation of the azo dye "1.8-Dihydroxy-naphthalin-3, 6 disulfonic acid [2-(4-Azo)]-N-(5-methyl-3-isoxazolyl)-benzene sulfonamide" at same time by three continuous wave, green (λ=532 nm), red (λ=635 nm) and blue (λ=473 nm), laser beams. This effect we observed at power input less than 10 mW for the pump 532 nm green laser and as low as 50 μW of beams from other two wavelengths. The number of rings for all three beams is totally controlled by the level of pump input power. The optical limiting of the azo dye solution using the 532 nm green laser beam is also demonstrated. The change in the material refractive index, Δn, the nonlinear refractive index , n_2, and the thermo-optical coefficient *dn/dT* are calculated based on thermal lens and diffraction ring techniques. The three quantities are found to be in the range of 10^{-4}, $10^{-7}\,cm^2/W$ and $10^{-5}\,K^{-1}$ respectively by both techniques.

Keywords: Thermal effects, diffraction rings, nonlinear refractive index, diffraction ring.

1. Introduction

The various important phenomena (such as the self-focusing and defocusing, self-phase modulation, figuration of spatial rings, and breaking up of beams) are happening and accompanying the laser beam propagated in media with non-linear property and intensity which are dependent on the refractive index and absorption coefficient. [1]. The laser matter- interaction modifies the spatial profile as a result of using Gaussian laser beams. The formation of spatial rings are understood to be induced by the modulation of spatial self-phases which are get up by the laser-induced refractive index [2-4]. Generally, the number of rings are depend on the axis non-linear phase shift experienced during the passage through the medium. Phase shift is depending on optical intensity,