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Diffraction ring patterns and z-scan measurements of nonlinear refractive index of khoba vegetable oil

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Abstract

The estimation of the nonlinear refractive index of khoba vegetable oil via diffraction ring patterns and Z-scan using continuous-wave (CW) visible, a single mode low power laser beam, is reported. Diffraction ring patterns are numerically obtained using Fresnel-Kirchhoff diffraction integral with good agreement. The khoba oil exhibited strong self-defocusing effect and the mechanism of optical nonlinearity in the low power regime is found to be predominantly of thermal origin. The optical limiting properties of khoba oil under CW illumination is investigated. Based on the obtained results, the khoba vegetable oil can be considered as a potential candidate for the use in photonic and nonlinear optical devices.

Keywords : Vegetable oil, Diffraction ring patterns, Z-scan, Nonlinear refractive index, Fresnel-Kirchhoff diffraction.

1. Introduction

Due to their potential applications in photonic devices, organic materials have been studied extensively from the point of view of their nonlinear properties [1-10] such as their nonlinear refractive indexes. During the last years almost for the first time the present authors directed their efforts to study the nonlinear response of vegetables oils to CW visible low power laser lights