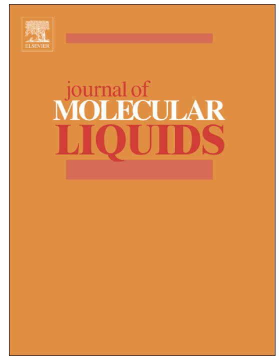

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Light-Induced Order Modification – the way to speed up

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Abstract

Absorption of light by a molecule sitting in a liquid crystalline (LC) medium firstly affects the orientational ordering of its closest neighbours. A generalised Light-Induced Order Modification (LIOM) model has been developed that accounts for the changes of the refractive indices of a thin LC layer resulted from the light-stimulated modulation of the LC order parameter. The LIOM-mechanism explains experimentally observed large optical nonlinearities with extremely fast as for the LC system recording times. Due to the efficient local response a very high resolution has been achieved (< 1 μm) accompanied with quite high diffraction efficiency within the very wide intensity range of the actinic light. Being strictly local, the LIOM-mechanism allows for a spatial resolution opening new possibilities for volume grating recording. Effective at any wavelength it could also be applied for creation of arbitrary phase profiles over extensive areas as requested in several applications for light beam manipulation.

Keywords

Nonlinear optics; two-wave mixing; dynamic grating; liquid crystal; order parameter

Introduction

Liquid crystals (LC) play an important role in many scientific and technological areas as a result of their unique physical and optical properties. Having strong birefringence, revealing high sensitivity to external fields, liquid crystals appear in nearly all existing optoelectronic materials and technologies. Almost all known nonlinear optical phenomena have been observed in liquid crystals due to their extraordinarily large optical nonlinearities that span over multiple time scales in a spectral range from the visible to infrared and beyond [1].