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Fast Nolinear Optical Mechanisms in Bi-Layered Cells Composed by Lyotropic Ionic Liquid Crystals with Dye and Viologen Films

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Mechanisms of the fast optical nonlinearity are studied in two types of cells based on lyotropic ionic liquid crystals (LILC) of metal alkanoates. They are (I) bi-layer cell, which consists of a thin dye film covered by LILC, and (II) LILC with electrochromic impurity (viologen). Applying dc electric voltage to the cell II leads to adsorption of viologen redox products with formation of a thin nanosized layer on the cathode. The dynamic holographic technique with pulsed laser radiation of the nanosecond duration was used to investigate nonlinear optical properties in both types of cells. The mechanism of photoconversion of viologen redox products under strong laser radiation is proposed to explain grating recording in the cell II.

Keywords: bi-layer cells; electrochromic impurities; lyotropic ionic smectic; optical nonlinearity

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1. INTRODUCTION

Fast development of photonics applications demands creation of novel materials with advanced properties. Thin films that combine large third-order nonlinear susceptibility and ultrafast response are studied intensively due to their potential applications for all-optical switching, high-speed optical networks, light-controlled phase,

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