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Program and Abstracts

Nonlinear-optical recording in ionic liquid crystalline medium

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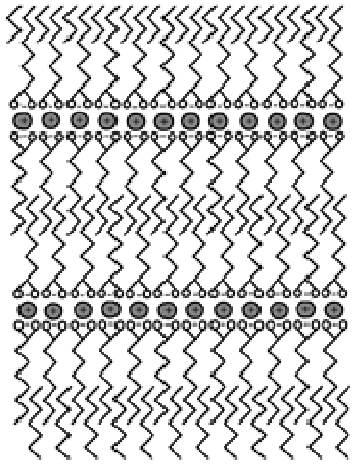
Ionic liquids, i.e. melted salts composed of ions or short-lived ion pairs, represent a very interesting class of materials with fascinating and unique properties. Among these a particular type of compounds could be distinguished – the ionic liquid crystals (ILC), which are characterized with the long-range orientational ordering of molecules, promising many exciting applications, for instance, as a template for precise synthesis and stabilization of semiconductor or metal nanoparticles [1]. Last decade they have been also calling much attention in view of their optical, electro-optical and nonlinear optical properties [2].

Cobalt alkanoate compounds $(C_nH_{2n+1}COO^-)_2Co^{2+}$ (n = 7, 9, 11) form liquid crystal state (Smectic A) [3, 4] under melting – a structure of alternating layers of Co^{2+} cations and alkanoate ligands with constant period (Figure). It could be easily overcooled to form a smectic glass preserving the fine layered structure.



Nonlinear optical properties of these compounds have been studied by means of a standard two-wave mixing technique with the use of the second harmonic of a pulsed Q-switched Nd:YAP laser (wavelength λ = 539.8 nm, pulse duration t_p = 20 ns). A single laser pulse resulted in dynamic grating recording and a strong self-diffraction was observed.

The nonlinear optical response appeared due to the modulation of the complex refractive index at the excitation of cobalt octahedral complexes (coordination number = 6) with oxygen atoms of carboxyl groups COO^- of alkanoate ligands possessing delocalized π-electrons. Studied liquid crystalline materials featured very large and fast nonlinear response and are promising media for holographic recording realization.

References

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[2] Yu .A. Garbovskiy *et al*, Liquid Crystals. **37**, 1411 (2010).