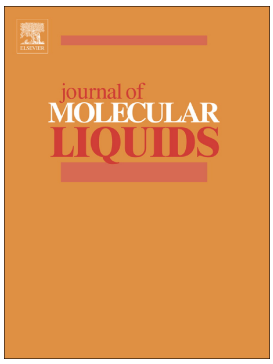

Liquid crystal light valve with a semiconductor substrate for dynamic holography in the infrared

Konstantin Shcherbin, Igor Gvozdovskyy, Dean R. Evans

PII: S0167-7322(17)34560-9
DOI: https://doi.org/10.1016/j.molliq.2017.12.073
Reference: MOLLIQ 8369

To appear in: *Journal of Molecular Liquids*

Received date: 28 September 2017
Revised date: 10 November 2017
Accepted date: 14 December 2017

Please cite this article as: Konstantin Shcherbin, Igor Gvozdovskyy, Dean R. Evans , Liquid crystal light valve with a semiconductor substrate for dynamic holography in the infrared. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Molliq(2017), https://doi.org/10.1016/j.molliq.2017.12.073

Liquid crystal light valve with a semiconductor substrate for dynamic holography in the infrared

Konstantin Shcherbin[1,*], Igor Gvozdovskyy[1], and Dean R. Evans[2]

[1]Institute of Physics, National Academy of Sciences, Prospekt Nauki 46, 03680 Kiev, Ukraine

[2]Air Force Research Laboratory, Materials and Manufacturing Directorate, Wright-Patterson Air Force Base, OH 45433, USA

[*]corresponding author, e-mail: kshcherb@iop.kiev.ua

Abstract

Recording of dynamic holograms in the near infrared spectral range is reported for a liquid crystal light valve with a GaAs semi-insulating substrate. The interaction of weak signal and strong pump waves are studied. It is demonstrated that an out-of-phase local dynamic grating is recorded. Optimal amplitude and frequency of the applied voltage are found for maximum amplification of the weak beam. Step-like external phase modulation of the signal wave with amplitude $\pi/2$ is used to change the type of response from local to nonlocal and to achieve in such a way additional transient signal beam amplification. Study of the cells with different thicknesses of the liquid crystal layer at different grating spacings allows a seventeen-fold gain of the weak beam in the device with the thickest liquid crystal layer of 16 μm at a grating period of 1000 μm (the largest possible in our set-up). The amplitude of the refractive index modulation and nonlinear coupling constant n_2 are estimated from the experimental results.

Keywords: liquid crystals; liquid crystal light valves; spatial light modulators; dynamic gratings; nonlinear optics.

1. Introduction