Nanostructured surfaces

Optically induced surface gratings on carbazole-based azopolymer films

A. Meshalkin[1], S. Robu[1,2], A. Prisacar[1], Yu. Boiarinov[1], D. Shepel[3], E. Achimova[1], O. Paiuk[4], A. Stronski[4]

[1] *Institute of Applied Physics, Academy of Sciences of Moldova. 5 Academiei str., MD-2028, Chisinau, Moldova.E-mail: alexei@asm.md*

[2] *State University of Moldova. 60 Mateevici str., MD-2009, Chisinau, Moldova.*

[3] *Institute of Chemistry, Academy of Sciences of Moldova. 3 Academiei str., MD-2028, Chisinau, Moldova.*

[4] *V.Lashkaryov Institute of Semiconductor Physics, National Academy of Sciences of Ukraine, Kyiv, Ukraine. E-mail: paiuk@ua.fm*

Recently polymer materials with azodyes become attractive materials for holographic recording due to possibility of surface relief grating fabrication without any subsequent treatment. Large surface modulation (up to 20% of the original thickness of film) could be obtained under optimal recording conditions [1]. In this work the synthesis and characteristics study of the copolymer of poly(9-epoxypropyl)carbazole (EPC) with azodye Disperse Orange, synthesized at the Chemistry Department of State Unoversity of Moldova was carried out. Copolymer of epoxypropylcarbazole with Disperse Orange was obtained by polycondensation scheme in closed ampoule at a temperature of 120º C for 4 hours. The copolymer was purified by precipitation in hexane and then in methanol. The resulting material was investigated by FTIR spectroscopy using attenuated total reflectance (ATR) accessory of Spectrum 100 FTIR (PerkinElmer) spectrometer in 4000 - 650 cm^{-1}. Copolymer thin films were prepared by spin coating of the 10 wt.% polymer solution in toluene onto glass substrate. The absorption band ranges from 400 nm to 580 nm with an absorption peak at 460 nm. Therefore a DPSS blue 473 nm and green 532 nm lasers are suitable for the holographic recording. Different gratings were experimentally realized and polarization dependence in the formation of SRG was investigated. We studied the formation of gratings with different polarization configurations. We report observation of holographic surface relief gratings with relatively large amplitude on EPC:DO copolymer without any subsequent processing steps. It was found that the formation of surface relief grating strongly depends on the polarization configuration during recording and in the best case the largest amplitude of surface relief grating was about 130nm (48% of film thickness). The metal (Al) coating could efficiently enhance the diffraction efficiency of the relief grating up to 25%.

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1. *Kim D. Y., Tripathy S. K., Li L., Kumar J.* Laser-induced holographic surface relief

gratings on nonlinear optical polymer films // *Appl. Phys. Lett., 66, 1166–1168, 1995.*