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Holographic photosensitivity of azobenzene molecular and chalcogenide glassy films

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Abstract: In this paper, we have experimentally studied photosensitivity light intensity dependence in three azobenzene molecular glassy films and in one chalcogenide As-S-Se glassy film. Transmission holographic gratings with the period of 2.0 μm were recorded in the above mentioned films by two equally strong symmetrically incident 633 nm He-Ne laser beams with *p-p* polarizations and self-diffraction efficiency (SDE) was continuously measured. Studied azobenzene molecular glasses were synthesized by our group. They included WE-3 or 2-(4-((4-(bis(2-triphenylsilyloxy)ethyl)amino)phenyl)diazenyl)benzylidene)-1*H*-indene-1,3(2*H*)-dione, ZWK-3 or 2-(2-(4-((4-(bis(2-trityloxy)ethyl)amino)-phenyl)diazenyl)styryl)-6-styryl-4*H*-pyran-4-ylidene)-1*H*-indene-1,3(2*H*)-dione, ZWK-2TB or 2-(2-(4-((4-(bis(2-(trityloxy)ethyl)amino)phenyl)diazenyl)-styryl)-6-tert-butyl-4*H*-pyran-4-ylidene)-1*H*-indene-1,3(2*H*)-dione. About 3 μm thick films were spin-coated onto the glass substrates. To characterize the film photosensitivity we have determined the recording energies $E=It$ corresponding to SDE=0.096% and SDE=0.25% at certain intensity values I= 0.011, 0.034, 0.10, 0.32 and 1.13 W/cm^2 (t-exposure time). Besides, so called Lin sensitivities, $S=(SDE)^{0.5}E^{-1}$ corresponding to SDE_{max} were determined, too. The main result in the case of all films is that photosensitivity generally increases when the recording light intensity is increased A simple model is proposed explaining the observed intensity dependences.

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