Laser induced birefringence in La–Ga–S–O–Gd glass polymer nanocomposites

ABSTRACT

In this work, we demonstrate a possibility to use Laï Gaï Sï Oï Gd glass polymer nanocomposites as effective materials for photo-induced birefringence. Here we chose PVA as a photopolymer matrix. The photo-induced effects were studied using 8 ns Nd: YAG laser generating bicolor coherent light beams with wavelengths 1064, and 532 nm. The detection of the photo-induced birefringence was carried out using cw Heï Ne laser at 1150 nm. The optimal concentration of the nanoglass favoring maximal changes of refractive indices is established. The photo-induced laser power density was changed up to 0.9 GW/cm2. The photo-induced beams were incident at angles varying within the 32° and 52° with respect to the nanocomposite planes. The polarizations of the beams did not play principal role. We discovered an appearance of maximal birefringence equal to about 0.078. The effect is strongly dependent on the nanoparticle sizes and is completely reversible after switching off the laser treatment within several milliseconds. Such features are useful for the recording of optical information and production of gratings with desirable periods.

Keyword: Laï Gaï Sï Oï Gd glass polymer; Photo-induced birefringence; Laser; Birefringence