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New Method for Determining the Distribution of Birefringence and Linear Dichroism in Polymer Materials Based on Polarization-Holographic Grating

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Abstract : A new method for determining the distribution of birefringence and linear dichroism in optical polymer materials is presented. The method is based on the use of polarization-holographic diffraction grating that forms an orthogonal circular basis in the process of diffraction of probing laser beam on the grating. The intensities ratio of the orders of diffraction on this grating enables the value of birefringence and linear dichroism in the sample to be determined. The distribution of birefringence in the sample is determined by scanning with a circularly polarized beam with a wavelength far from the absorption band of the material. If the scanning is carried out by probing beam with the wavelength near to a maximum of the absorption band of the chromophore then the distribution of linear dichroism can be determined. An appropriate theoretical model of this method is presented. A laboratory setup was created for the proposed method. An optical scheme of the laboratory setup is presented. The results of measurement in polymer films with two-dimensional gradient distribution of birefringence and linear dichroism are discussed.

Keywords : birefringence, linear dichroism, graded oriented polymers, optical polymers, optical anisotropy, polarization-holographic grating
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