SPECTROSCOPIC STUDIES OF THE RED LIGHT SURFACE RELIEF GRATING RECORDING IN STILBENE AZOBENZENE DERIVATIVES

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Surface relief grating (SRG) recording have been spectroscopically studied in two types of stilbene azobenzene derivative films spin-coated onto glass substrates.These films were amorphous organic glasses rather than polymers. Recording of SRG was made by a He-Ne laser at 633 nm. The AFM measurements revealed the maximum thickness changes of 124 nm and 246 nm for the two samples, respectively. These SRG were stable, at least, during a year. Thus SRG have been recorded in the red spectral region for the first time , to our knowledge.

To elucidate the recording mechanism, the absorption spectra were measured in recorded and unrecorded areas by Ocean Optics Spectrometer HR4000 with a 200 μm fibre probe in the 600 – 1000 nm spectral range, and by Perkin Elmer 35 UV-VIS spectrometer in the 300 – 1000 nm spectral range. In the latter case the measurement was the average over the 25 overlapping 1.93 mm holographic gratings recorded in the square of 5 mm × 5 mm. It was found that the 633 nm irradiation with a 0.88 W/cm^2 intensity during 30 minutes has decreased the absorption monotonically in the 300 – 600 nm range, and has increased the absorption in the 750 – 1000 nm range. It was also found that amplitude-phase gratings due to the photoinduced modulation of absorption and refraction indices were recorded as well, and that some absorption changes took place also after the recording. The possible SRG recording mechanisms have been considered. The conclusion is made that, most probably, the SRG recording in stilbene azobenzene derivatives is due to the photoablation and/or due to the photodegradation of chromophores.