Main-Chain Azobenzene Polymers as Orientation Materials for Liquid Crystal Photoalignment

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Light-induced control of polymer properties enables various potential applications, including optical storage, shape-memory systems, nonlinear optical materials, and photoalignment of liquid crystals (LCs) [1, 2]. We report the synthesis of new aromatic fluorinated copolyethers with photosensitive azobenzene units in the main chain. The polymers form flexible films with tensile strengths of 25–70 MPa, high T_g values (~150 °C), and excellent thermal stability up to 480 °C. Reversible light-induced birefringence changes in the polymer thin films were achieved under irradiation with polarized light at wavelengths of 405 and 532 nm, enabling recording of polarization diffraction gratings. We showed that polarized UV irradiation of substrates coated with azo-polyethers enables uniform alignment of LCs (Figure 1). The LC alignment quality and azimuthal anchoring characteristics of the polymers were also analyzed. Therefore, these polymers are highly promising for practical optical applications, particularly in light-manipulating and photoalignment of LCs.

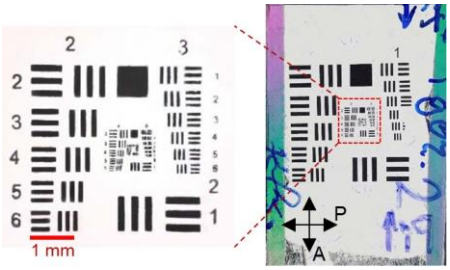

Figure 1. Photos test-structure of LC cell between crossed polarizers

References

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