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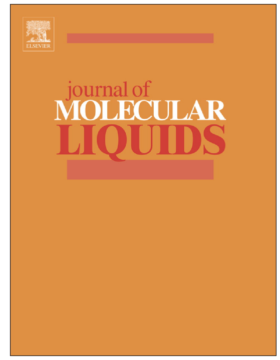

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Dual-Function Reversible/Irreversible Photoalignment Material

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Abstract

We report on new modification of visible sensitive SPAAD series photoalignment materials (BEAM Co) and a method of alignment/treatment to create a photoalignment layer that can be reversible or fixed in a polymerizable matrix. The irreversible state is stable to exposures with to visible as well as ultraviolet radiation.

Keywords

photoalignment; liquid crystal; liquid crystalline polymer; patterning; anchoring; azobenezene.

1. Introduction

Photoalignment process is widely used for aligning liquid crystals (LCs) and LC monomers both for research and applications [1]. The method became possible for practical applications due to the developments within the past 20 years of suitable photoalignment materials. Any such material by definition has two critical properties:

(1) The material can become anisotropic, and the orientation of individual molecules of a thin layer of such material can be forced to a desired angle by irradiation with linearly polarized light of appropriate wavelength. This process is called photoalignment.

(2) Once the material has been photoaligned, it can be used to align thin layers of LCs or LC monomers. Thus, the alignment imposed on the photoalignment layer can be relayed to LC or LC monomer materials that are in contact with the photoalignment layer.

Photoalignment is a non-contact method, which induces anisotropy in photosensitive material by actinic light due to photochemical reaction (photodegradation, cross-linking, photo-reorientation or trans-to-cis isomerization of the molecules) [2-6]. Photo-induced anisotropy provides corresponding alignment of the LC due to anchoring with the surface. By changing the optical axis alignment pattern imposed on the photoalignment layer, it is possible to produce a wide variety of optical components, including diffractive waveplate lenses, beam steering devices, and vector vortex patterns [7]. Such components are then used in a wide variety of applications.

PAAD series (BEAM Co) of photoalignment materials are based on azobenzene molecules that can undergo tran-cis photoisomerization and be re-oriented by polarized light in perpendicular direction to the polarization. Different PAADs are suitable for different actinic light wavelengths depending on the