

Direct Observation of Liquid Crystal Director Distribution with Directional Polymerization of Reactive Mesogen

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The directional ordering of the liquid crystal (LC) molecules has attracted much attention in studies of the mechanism of LC alignments and improvement of the performance of their practical devices. The orientational ordering of LC molecules is governed by the contact with alignment layers which have particular surface morphologies and chemical effects of materials such as polymers. To control the LC molecular ordering, many kinds of methods are introduced such as rubbing polymer films, oblique deposition of SiO_x, ultraviolet light exposed patterned polymer films, and other methods that produce a grooved surface. However, direct observation of LC director distribution without the introduction of an external agent has not been studied.

In this paper, we present a method for directional distribution of LC molecules using directionally polymerized photo-reactive mesogen (RM) on an alignment layer. The RM monomers within an alignment layer are dissolved in the LCs due to liquid crystalline property of RM and aligned along the LC molecules to reduce the excluded volume [1,2]. Through UV exposure, the aligned RM monomers are directionally polymerized along the LC alignment, as a result, we can directly observe the distribution of LC molecules at even optically indistinguishable state. The scanning electron microscopic and atomic force microscopic images are presented comparing with optical polarizing microscopic images for LC molecular distribution.

References

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