

Pre-Polymer Effect in Polymer-Liquid Crystal Composite System for Display Applications

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Liquid crystal (LC) devices with plastic substrates have drawn considerable attention for next-generation information displays because of their excellent portability, such as light weight, thin packaging, and flexibility [1]. For the flexibility of plastic LC device, it requires a stabilization of LC mode, mechanical stability, and tight adhesion of two substrates. It has been wide studying to solve such problems by introducing the phase separation of polymer-LC mixture, such as polymer dispersed LC, polymer network LC, phase-separated composite film (PSCOF) of LCs, and pixel isolated LC (PILC) mode [2-6]. Among them, PSCOF and PILC mode show excellent electro-optic characteristics, good mechanical stability, and good adhesion of two substrates. After phase separation, however, the unreacted pre-polymers and unfixed floating polymers in polymer-LC composite systems give rise to degradation of the device performance.

In this paper, we report influence of the unreacted pre-polymers and unfixed floating polymers in polymer-LC composite systems on display performance. We quantitatively evaluate the in-situ polymerization ratio during phase separation in polymer-LC composite systems. Also, we discuss the correlation of the unreacted pre-polymers and unfixed floating polymers with display performance such as uniformity, image sticking, operating voltage, transmittance, response time, and so on.

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