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Unusual Phase Separation Kinetics of Polyacrylate/E7 Blends

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The transmission versus time curves of in-situ UV-cured Tripropyleneglycoldiacrylate (TPGDA)/E7 films reveal three regions: A first domain corresponding to a transparent film of the initial TPGDA/E7 mixture before exposure to UV light. In the second time domain, the sample exhibits a fast relaxation process just after the beginning of the UV irradiation of the monomer/LC blend. A surprising third domain, characterised by an enhancement of the film transparency, is observed at longer relaxation times. This process, covering a period of time going from several milliseconds to minutes, depends on the conditions of sample preparation and film thickness.

Keywords Liquid crystal; monomer; phase separation kinetics; relaxation times; ultraviolet irradiation

1. Introduction

Polymer Dispersed Liquid Crystals (PDLCs), discovered some twenty five years ago by Fergason [1,2] and extensively studied by a large number of laboratories [3–14], represent great potential for a variety of electro-optical applications such as smart windows [3,4] and information displays. In their most common form, PDLC films are made of micron-sized liquid crystalline (LC) domains dispersed in a solid polymer matrix. The orientation of the LC molecules inside the domains change upon application of an electrical field and under certain conditions, the intensity of the transmitted light can be varied between an opaque off-state to a transparent on-state. These systems are generally prepared by a technique of phase separation induced by polymerization/crosslinking reactions (PIPS) of monomers under

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