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Mechanical Properties of Polymer/Liquid Crystal Films Elaborated by Electron Beam and UV Radiation

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The thermomechanical properties of electron beam (EB) and ultraviolet (UV) cured TPGDA (tripropyleneglycol diacrylate)/liquid crystal (LC) blends were the subject of static and dynamic analysis. In the glassy region of the LC, a very strong temperature dependence on the polymer storage modulus was found for EB-cured networks in the range of compositions 40–60 weight.-% of LC. Above the LC glass transition temperature (T_g), the LC behaves like a plasticizing agent. Below T_g of the LC, the LC reinforces the polymer. In the case of the UV-cured system, the effect of plasticizing of the LC remains dominant from −100 to +100°C.

Keywords Electron beam; glass transition temperature; liquid crystal; mechanical properties; polymer; ultraviolet

1. Introduction

Radiation curing is a widely used technique for applications in thin film coatings, adhesives, paintings etc. [1–7]. Although UV curing is more often used because it does not require any heavy equipment or special care, the electron beam method (EB) has great advantages. EB curing has the advantage of not requiring the presence of a photoinitiator which might be detrimental to Polymer Dispersed Liquid Crystal (PDLC) film performances and to long term ageing. In view of a particular application, the basic formulation can be adapted by the right choice of chemical structures and molecular weights of the polymer precursors, and also by the spatial

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