

# Phase Properties of Interpenetrating Polymer Networks and Liquid Crystals

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*The phase behavior of interpenetrating acrylic polymer network/liquid crystal systems was investigated. The crosslinked polymers were obtained by UV-curing of initial solutions containing a reactive monomer, a crosslinker and a photoinitiator. Experimental phase diagrams were established using polarizing optical microscopy observations of the variation of equilibrium swelling of polymer/liquid crystal systems with temperature. The experimental data were rationalized within a combination of the Flory-Rehner theory of isotropic mixing and the Maier-Saupe theory of nematic ordering.*

**Keywords** Interpenetrating polymer networks; liquid crystal; phase diagrams; swelling behavior

## 1. Introduction

The phase behavior of polymer-solvent systems has important applications in industry for production and processing of many kinds of plastic materials [1-4]. From a fundamental point of view, it raises basic questions concerning the phase properties of multi-component systems with widely different characteristics. From the point view of their applications, these systems are useful in various fields such as display technology and privacy windows [5,6].

The phase diagram provides information about the thermodynamic stability of the coexisting phases as a function of temperature and composition. Establishment of phase diagrams is thus the beginning point in any kind of research on blends of LC and polymer (linear or cross-linked).

There have been many reported theoretical studies on equilibrium phase behavior of LC/polymer blends [7-11]. Benmouna *et al.* [12-14] performed a study on the theoretical phase diagrams of mixtures of cross-linked polymers and the

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