

Comparative study of the morphology of polysiloxane/liquid crystal systems

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ABSTRACT: Mixtures of polymers and liquid crystals have several applications in the optical fields, in controlled opacity glazing and display screens [1-3]. Most of the applications rely on specific electro-optical responses depending on both the phase behavior and the thermodynamic properties as well as the morphology and dimensions of the liquid crystals.

A detailed study of these properties is necessary to better understand and improve performance under practical conditions.

Mixtures of nematic liquid crystal E7 and two different types of linear and isotropic polysiloxane were studied in this work, polymethylphenylsiloxane (PMPS) with molecular weight $M_w = 9600$ and 70900 g/mol and polydimethylsiloxane (PDMS), molecular weight $M_w = 5300$ g/mol.

These systems have been studied by optical microscopy (POM) and differential scanning calorimetry (DSC).

E7 being a eutectic mixture of three cyanobiphenyls and a cyanoterphenyl which can have different miscibility with respect to the polymer matrix resulting in modifications of the quantity of liquid crystal in the droplets.

The morphology study was monitored by two variables: liquid crystal mass composition and temperature.

All photos of PMPS and PDMS samples mixed with E7 were taken under heating at $0.5^\circ\text{C}/\text{min}$.

A relatively large miscibility was observed for the PMPS/E7 systems, unlike the PDMS/E7 system.

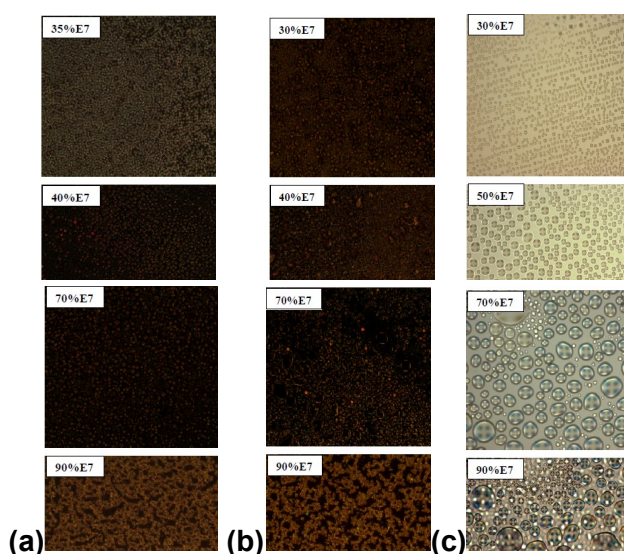


Figure: Morphology of samples PMPS9600/E7 (a); PMPS70900/E7 (b); PDMS5300/E7 (c) at different concentrations observed at the MOP at a temperature of 20°C , in the Nematic+Isotropic state (N+I).

KEY WORDS: Phase diagram, liquid crystal, Morphology, Miscibility.

References

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