

Effect of Different Parameters on the Swelling Behaviour of Thermo-Responsive Elastomers in a Nematogenic Solvent

Authors : Nouria Bouchikhi, Soufiane Bedjaoui, C. Tewfik Bouchaour, Lamia Alachaher Bedjaoui, Ulrich Maschke

Abstract : Swelling properties and phase diagrams of binary systems composed of liquid crystalline networks and a low molecular mass liquid crystal (LMWLC) have been investigated. The networks were prepared by ultraviolet (UV) irradiation of reactive mixtures including a monomer, a cross-linking agent and a photo-initiator. These networks were prepared using two cross-linking agents: 1,6 hexanedioldiacrylate (HDDA) and a mesogenic acrylic acid 6-(4'-(6-acryloyloxy-hexyloxy) biphenyl-4-yl oxy) hexyl ester (AHBH). The obtained dry networks were characterized by differential scanning calorimetry, and immersed in an excess of a LMWLC solvent 4-cyano-4'-pentylbiphenyl (5CB), forming polymer gels. A detailed study by polarized optical microscopy allowed to determine the swelling degree of the gels and to follow the phase behavior of the solvent inside the polymer matrix in a wide range of temperature. It has been found that the gels undergo a sharp decrease of their swelling degree in response to an infinitesimal change of temperature. This finding adds new and interesting aspects on the actuators applications. We have subsequently explored the effect of different parameters on volume phase transition of these liquid crystalline materials. Such as the cross-linking density (CD), a nature of cross-linking agent and the photo initiator concentration.

Keywords : cross-linking density, liquid crystalline elastomers, phase diagrams, swelling

Conference Title : ICPMSE 2015 : International Conference on Polymer Materials Science and Engineering

Conference Location : Istanbul, Türkiye

Conference Dates : July 29-30, 2015