World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:9, No:05, 2015

Preparation and Electro-Optic Characteristics of Polymer Network Liquid Crystals Based On Polymethylvinilpirydine and Polyethylene Glycol

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Abstract : The polymer network liquid crystals based on the liquid crystals H37 and 5CB with polymethylvinilpirydine (PMVP) and polyethylene glycol (PEG) have been developed. Mesogene substance 4-n-heptyoxibenzoic acid (HOBA) is served for stabilization of obtaining composites. Kinetics of network formation is investigated by methods of polarization microscopy and integrated small-angle scattering. It is shown that gel-like states of the composite H-37 + PMVP + HOBA and 5CB+PEG+HOBA are formed at polymer concentration above 7 % and 9 %, correspondingly. At slow cooling, the system separates into a liquid crystal –rich phase and a liquid crystal-poor phase. At this case, transition of these phases in the H-37 + PMVP + HOBA (87 % + 12 % + 1 %) composite to an anisotropic state occurs at 49 oC and и 41 oC, accordingly, while the composite 5CB+PEG+HOBA (85% +13 % +2%) passes to anisotropic state at 36 oC corresponding to the isotropic-nematic transition of pure 5CB. The basic electro-optic parameters of the obtained composites are determined at room temperature. It is shown that the threshold voltage of the composite H-37 + PMVP + HOBA increase in comparison with pure H-37 and, accordingly, there is a shift of voltage dependence of rise times to the high voltage region. The contrast ratio worsens while decay time improves in comparison with the pure liquid crystal at all applied voltage. The switching times of the composite 5CB + PEG + HOBA (85% +13 % +2%) show anomalous behavior connected with incompleteness of the transition to an anisotropic state. Experimental results are explained by phase separation of the system, diminution of a working area of electro-optical effects and influence of areas with the high polymer concentration on areas with their low concentration.

Keywords : liquid crystals, polymers, small-angle scattering, optical properties
Conference Title : ICCMMP 2015 : International Conference on Condensed Matter and Materials Physics
Conference Location : Paris, France
Conference Dates : May 18-19, 2015