ELS-XV-2015 Abstracts
ELS-XV-2015-11
Electromagnetic & Light Scattering XV 2015, Leipzig

Scattering by monolayer of oriented liquid crystal droplets with modified surface anchoring

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Light scattering by a monolayer of oriented liquid crystal (LC) droplets in polymer matrix is considered. A method for modeling transmittance and angular distribution of scattered light by a monolayer of LC droplets is developed. The internal structures of nematic LC droplets are calculated on base of the free energy minimization problem solution using the relaxation method. The anomalous diffraction approach and the Wenzel-Kramers-Brillouin approaches are used for scattering by a single droplet.
The results for monolayers of spherical LC droplets with homogeneous and inhomogeneous boundary conditions are considered. The last are based on modification of boundary conditions by the ionic surfactants. They essentially reduce value of the electric field [1] in comparison with the ordinary PDLC films.
The method is used to analyze transmittance, angular structure, and polarization characteristics of light scattered by a monolayer of liquid crystal droplets. It is shown asymmetry in the angular structure of transmitted light over the polar angle [2] for layers containing droplets with inhomogeneous boundary conditions. The method can be used to study field- and temperature-induced phase transitions in LC droplets by analyzing the transmittance, polarization, and angular distribution of forward-scattered light.

[1] Zyryanov V.Ya., Krakhalev M.N., Prishchepa O.O., Shabanov A.V. Orientational structure transformations caused by the electric-field-induced ionic modification of the interface in nematic droplets. JETP Lett. 2007;86:440–445.
[2] Loiko V.A. , Zyryanov V.Ya., Maschke U., Konkolovich A.V., Miskevich A.A., Small-angle light scattering and transmittance of polymer film, containing liquid crystal droplets with inhomogeneous boundary conditions. J. Quant. Spectr. & Rad. Transfer. 2012;113: 2585–2592.