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Effect of polymer-coated gold nanoparticles on the flexoelectricity in planar thin films of pentylcyanobiphenyl (5CB) nematic liquid crystals

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The flexoelectricity1 providing linear coupling is a phenomenon that takes place in liquid crystal systems. If the nematic liquid crystals (NLCs) molecules are slightly pear shaped and exhibit a longitudinal permanent dipole, like the cyanobiphenyls, an applied field not only orients the nematic director along the field direction but also causes a slight splay distortion of the director field. The most important aspect of this effect is that positive and negative voltages cause opposite splays, creating a first harmonic electro-optic response2,3. The flexoelectric effects in NLCs-based composites have not been investigated systematically.

In this work, the flexoelectricity in planar thin films of NLCs pentylcyanobiphenyl (5CB) nanostructured by inclusion of gold nanoparticles (AuNPs) were studied. Polymer-coated nanospheres of AuNPs with a mean diameter of 20 nm were dispersed in 5CB at a concentration of 0.5 wt% 4. AuNPs/5CB nanocomposite films with a thickness of 25 μm were characterized by polarizing microscopy and flexo-electro-optic spectroscopy. The flexoelectric origin of the first harmonic spectra in AuNPs/5CB nanocomposite nematic system was discussed.

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Primary authors: MARINOV, Yordan G. (Georgi Nadjakov Institute of Solid State Physics, Bulgarian Academy of Sciences); HADJICHRISTOV, Georgi B. (Georgi Nadjakov Institute of Solid State Physics, Bulgarian Academy of Sciences); PETROV, Alexander G. (Georgi Nadjakov Institute of Solid State Physics, Bulgarian Academy of Sciences)

Presenter: MARINOV, Yordan G. (Georgi Nadjakov Institute of Solid State Physics, Bulgarian Academy of Sciences)

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