

Abstract Submitted
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Dielectric Anisotropy, Elastic Constants, and Threshold Voltage Measurements of Gold-nanoparticle Colloids in Nematic 5CB¹ ANGELO VISCO, JON FOUST, JOSEPH BELOBRADICH, RIZWAN MAHMOOD, DONALD ZAPIEN, Slippery Rock Univ — We have explored electro-optical and thermal properties of gold nanoparticles (GNPs) colloids in 4-cyano- 4'-pentylbiphenyl (5CB) liquid crystals (LCs). GNP's do not readily disperse in a LC host and, so, have been treated with either, 1-Hexane-thiol, 1-Dodecane-thiol, or 1-Octadecyl-thiol. This treatment suppresses the aggregation of GNPs within the 5CB host to a threshold of approximately 0.7% GNP by weight. Our measurements on dodecanethiol and hexanethiol treated GNPs showed an unusual, steep trough in the dielectric anisotropy and elastic constants at a critical concentration of 0.0862 wt. % GNPs in 5CB. Due to the order parameter, we have observed a peak in the transition temperature at the same critical concentration. Above the critical concentration the transition temperatures, dielectric anisotropy, and elastic constants level off to within experimental uncertainty. Measurements of dodecanethiol treated GNPs in 5CB reveal distinctions in the rate of change in dielectric anisotropy as compared to hexanethiol treated GNPs in 5CB. This effect is possibly due to the increased carbon concentration in dodecanethiol compared to hexanethiol. Attempts to mix the Smectic A (SmA), 8CB liquid crystal using our hexanethiol and dodecanethiol GNPs were unsuccessful for particle sizes of 100nm and 28nm. We suspect that this is due to an insufficient length of the carbon-chain and U.V. spectroscopy measurements may prove useful in characterizing the resulting aggregation. We hope the system will be helpful in modifying the properties of mesophases that may ultimately result in developing new electro-optical devices.

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