

Alignment effects and electro-optic properties of nematic LC and non-LC decorated gold nanoparticles in nematic LC hosts

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This study focuses on the miscibility of LC decorated gold nanoparticles (NPs) in nematic LCs. To explore if LC functional groups on the gold NP corona improve the compatibility (miscibility) with structurally related LC hosts, we examined mixtures of two LC hosts, **5CB** and **8CB** doped at 5 wt% with different types of gold NPs. Four alkylthiol-capped NPs were synthesized; two homogeneously coated with alkylthiols (**Au1** with $C_6H_{13}SH$ and **Au2** with $C_{12}H_{25}SH$), and two that were additionally capped at a different ratio with a mesogenic cyanobiphenyl end-functionalized alkylthiol (**Au3** and **Au4**). Investigating these mixtures in the bulk for settling of the NPs, and in thin films using polarized optical microscopy (POM) between untreated glass slides as well as POM studies and electro-optic tests in planar ITO/polyimide test cells revealed that the alkylthiol capped NPs **Au1** and **Au2** are more compatible with the polar cyanobiphenyl hosts in comparison to the NPs decorated with cyanobiphenyl units. All NPs induce homeotropic alignment in **5CB** and **8CB** between untreated glass slides, with **Au1** and **Au2** producing the characteristic birefringent stripes,¹ and **Au3** and **Au4** showing clear signs of aggregation. In rubbed polyimide cells, however, **Au3** and **Au4** fail to induce homeotropic alignment and again macroscopically aggregate.²

- (1) (a) H. Qi, T. Hegmann *J. Mater. Chem.* **2006**, *16*, 4197; (b) H. Qi, B. Kinkead, T. Hegmann, *Adv. Funct. Mater.* **2008**, *18*, 212.
 (2) H. Qi, B. Kinkead, V. M. Marx, H. R. Zhang, T. Hegmann, *ChemPhysChem* **2008** (submitted)

