

Effects of magnetic nanoparticles with different surface coating on the phase transition behaviour of 8CB: a high-resolution calorimetric study

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Adiabatic scanning calorimetry has been employed to investigate the effects of magnetic nanoparticles with different surface coating upon the isotropic to nematic (*I-N*) and nematic to smectic-A (*N-SmA*) phase transitions of 8CB liquid crystal.

The nanoparticles were coated with two different surface agents, aninopropyltriethoxysilane (APTS) and mercaptohexadecanoic acid (MHDA), respectively. Details about the preparation of samples can be found elsewhere (1). Mixtures of the same concentration were chosen for both samples (30.6 wt %).

Our high-resolution measurements revealed shrinkage of the nematic range (2). The *I-N* transition remains weakly first order and the *N-SmA* continuous, with the effective critical exponent α shifting from the previously reported (3) pure 8CB value (0.32 ± 0.03) towards the theoretical tricritical value (0.5). For APTS we find an effective critical exponent $\alpha = 0.35 \pm 0.01$ and for MHDA $\alpha = 0.39 \pm 0.01$ (2). Therefore, the impact strongly depends on the surface coating of the nanoparticles. A mean-field model, based on this study (2) as well as on our previous results on non-mesogenic solutes and 8CB mixtures (4), is presented in order to qualitatively explain the observed phenomena.

References

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