Structural behaviour of a mixture of liquid crystals and anisotropic nanoparticles

<u>M. Krasna</u>[a], M. Cvetko[a], M. Ambrozic[b], V PopaNita[c], S. Kralj[a]

a Faculty of Natural Sciences and Mathematics University of Maribor,
Koroska 160, 2000 Maribor, Slovenia
b Jozef Stefan Institite, Jamova 39, 1000 Ljubljana, Slovenia
c Faculty of Physics, University of Bucharest,
P. O. Box MG-11, Bucharest 077125, Romania

We study numerically and theoretically structural characteristics of a mixture of liquid crystals (LC) and anisotropic nano-particles (AP). Using a simple phenomenological approach we derive an effective free energy of the system which suggests structure of the coupling term between the LC molecules and AP. The term is bilinear in orientational order parameters and consequently enforces slave-master type (1) of phase behaviour. Regime, where a homogeneous mixture is expected, is estimated. Next we analyse orientational properties of the system using the Lebwohl-Lasher (2) lattice type approach. Orientational structure is calculated via minimization of the interaction energy of the system, where we concentrate to temperatures deep in the nematic phase. We calculate correlation functions as a function of interaction between LC and AP, external field strength and history of samples.

References (ACS format)
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