

Liquid crystals with carbon nanotubes and graphene- phase transition behaviour and influencing factors

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The behaviour of phase transitions in liquid crystal can be strongly affected by e.g. type and dimensions of the building blocks and presence of impurities. Monitoring the isotropic-nematic phase transition behaviour of a thermotropic nematic liquid crystal is possible to observe the effect of the presence of carbon nanotubes reflecting the presence of surface interaction between liquid crystal molecules and carbon nanotubes but also the influence of the method used for dispersing the nanotubes. The study of the phase transition behaviour is also useful in graphene oxide liquid crystal for estimating the dimensions and more specifically the effective thickness, that influence the value of the threshold of the nematic phase formation. In fact, the dimensions of the flakes, via their aspect ratio, are directly entering into the nematic phase formation threshold value according to Onsager's theory. Due to the extremely high aspect ratio of the flakes the nematic phase forms at extremely low concentrations in graphene and graphene oxide suspensions. However, the large dispersity in graphene flake size results in the bi-phase, i. e. coexistence of the isotropic and nematic phases. observable in a very broad concentration range value which also increases in time until stability is reached.