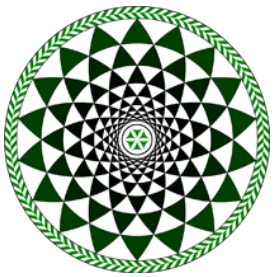

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Molecular dynamics in the smectic liquid crystal 4-n-butyloxybenzylidene-4′-n′-octylaniline (BBOA) in bulk and under confinement

Tuesday, 4 July 2017 19:10 (2 hours)

The molecular dynamics of 4-n-butyloxybenzylidene-4′-n′-octylaniline (BBOA, abbreviated also as 4O.8) was studied by broadband dielectric spectroscopy (BDS) for bulk samples that were exposed to various thermal treatments. Phase transitions between different liquid crystalline phases (N, SmA, SmBhex, and SmBCr) were evidenced by the alteration in the temperature dependence of the dielectric permittivity spectra and dielectric relaxation rates. A particularly complex molecular mobility was found for the highly ordered SmBCr phase that showed clear evidence for cooperative dynamics of a glass-forming liquid as manifested by a Vogel–Fulcher–Tammann (VFT)-type temperature dependence of its structural relaxation time $\tau(T)$. At low temperatures, dependence $\tau(T)$ again changes from VFT to Arrhenius behavior, a phenomenon commonly observed for supercooled liquids confined to nanometer length scales. The isothermal crystallization kinetics of the metastable SmBCr phase was described in terms of the classic Avrami approach and by the analytical method proposed by Avramov. Finally, the effect of geometrical confinement was studied for BBOA molecules enclosed in anodic aluminum oxide membranes with unidirectional pores of mean diameters 35, 55, 80, 100 and 150 nm. We analysed the impact of pore sizes on molecular mobility and thermodynamic stability of nematic and smectic phases.

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