Optical characterisation of the ferroelectric nematic liquid crystal phase in curved confinement

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The ferroelectric nematic (N_F) and related polar liquid-crystalline phases combine fluidity with spontaneous polarisation, making them attractive for reconfigurable photonic and low-voltage electro-optic applications [1,2]. In this study, we investigate the $N - N_F$ phase transition in a DIO/RM734 mixture confined to spherical droplets with diameters of 10–100 μm, dispersed in an isotropic liquid. Spherical droplets provide a useful model system for studying ferroelectric liquid crystals under curved confinement, where topology and surface anchoring can generate textures distinct from those in planar cells. To probe both orientational and polar order, we employ combined polarising optical microscopy (POM) and second-harmonic generation (SHG) microscopy on the same droplets [3]. POM reveals concentric birefringent rings and two $+1$defects, consistent with a bipolar tangential configuration, while SHG microscopy provides complementary information on the internal polar organisation through its sensitivity to broken inversion symmetry. The correlated POM and SHG response demonstrates the usefulness of combined linear and nonlinear optical microscopy for identifying director and polarisation textures in confined ferroelectric nematic systems.

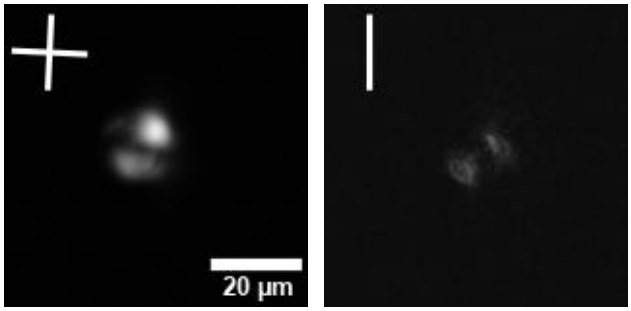

Figure 1. (Left) POM image of a droplet in the N_F phase at T = 30°C with crossed PA. (Right) SHG microscopy image of the same droplet at same conditions with the orientation of the incoming light polarization denoted with the bar.

References

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