Research news

Topology-dependent self-structure mediation and efficient energy conversion in heat-flux driven rotors by cholesteric droplets by J. Yoshiojka et al., *Nature Communications*, DOI: 10.1038/s41467-018-02910-z (2018).

Liquid crystals (LCs), when subjected to temperature gradients, exhibit rotation of the director field induced by the heat (heat-flux-induced rotation, HIR), known as Lehmann rotation. A theoretical explanation for HIR was provided by Leslie, where the rotation was attributed to the existence of chirality (in chiral nematics) with the induced rotational speed being proportional to the strength of the chirality. So far HIR has mostly been experimentally demonstrated in LC droplets, close to the Iso-N* phase transition. Yoshiojka et al. in their 2018 *Nature Communication* demonstrate HIR in a dispersion system, in which the N* droplets are immersed in an isotropic oligomeric fluid. Interestingly, the HIR in the dispersion system is found to depend upon topology within the droplets, unlike in a pure LC system. The rotational conversion efficiencies have been determined for droplets having five different types of director configuration, where two specific configurations have shown efficiencies, which are several orders of magnitude higher than that what is known to date.

Trigonal columnar self-assembly of bent phasmid mesogens by H. Cheng et al., *Chemical Communication*, vol. 54, page 156 (2018).

Columnar phases are one of the interesting mesophases and are most commonly observed as hexagonal phases. They are normally assembled from disc-like or fan-shaped molecules. Phasmids are a class of rodlike molecules with more than one chain attached at each end. Phasmids are also known as polycatenar mesogens. Cheng et al. have published a paper in *Chemical Communication* in which they report an investigation of the symmetry of columnar phases formed by phasmids. They have synthesised a series of bent-core phasmids exhibiting columnar phases and found that these molecules prefer trigonal columnar phase with threefold symmetry rather than sixfold symmetry and the columns are non-centrosymmetric. They show that in the trigonal phase, the self-assembled stars are located on a triangular lattice all with the same orientation and an efficient back-to-back packing of the three bent-cores is facilitated by flexibility in the core.

Cholesteric and screw-like nematic phases in systems of helical particles by Cinacchi et al., *Journal of Chemical Physics*, vol. 147, page 224,903 (2017).

The liquid crystal polymorphism in hard helices has been a subject of interest for many years to understand the propagation of chirality from the microscopic to the macroscopic scale. One of the recent developments in this area was the observation of a new chiral nematic phase, termed as screwlike (N_\text{s}*) nematic. N_\text{s}* was first observed in Onsager and Monte Carlo numerical simulation and was further experimentally confirmed in colloidal suspensions of helical flagella. Cinacchi et al. in their paper in *Journal of Chemical Physics* provide further details to clarify the nature of the nematic phases formed by helical particles, from Monte Carlo and molecular dynamics simulation. They have shown the existence of a N* phase for not-too curly particles and confirm the existence and stability of the N_\text{s}* phase for sufficiently curly helical particles.

Disclosure statement

No potential conflict of interest was reported by the author.

Mamatha Nagaraj

*School of Physics and Astronomy, University of Leeds, Leeds, UK*

M.Nagaraj@leeds.ac.uk