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Understanding Order and Correlation in Liquid Crystals by Fluctuation Scattering

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Characterising the supramolecular organisation of macromolecules in the presence of varying degrees of disorder remains one of the challenges of macromolecular research. Discotic liquid crystals (DLCs) are an ideal model system for understanding the role of disorder on multiple length scales. Consisting of rigid aromatic cores with flexible alkyl fringes, they can be considered as one-dimensional fluids along the stacking direction and they have attracted attention as molecular wires in organic electronic components and photovoltaic devices.

With its roots in single-particle imaging, fluctuation x-ray scattering (FXS) is a method that breaks free of the requirement for periodic order. However, the interpretation of FXS data has been limited by difficulties in analysing intensity correlations in reciprocal space.

Recent work has shown that these correlations can be translated into a three-and four-body distribution in real space called the pair-angle distribution function (PADF) – an extension of the familiar pair distribution function into a three-dimensional volume. The analytical power of this technique has already been demonstrated in studies of disordered porous carbons and self-assembled lipid phases.

Here we report on the investigation of order-disorder transitions in liquid crystal materials utilising the PADF technique and the development of facilities for FXS measurements at the Australian Synchrotron.

Level of Expertise

Early Career <5 Years

Presenter Gender

Man

Pronouns

Which facility did you use for your research

Australian Synchrotron

Students Only - Are you interested in AINSE student funding

Do you wish to take part in the Student Poster Slam

No

Condition of submission

Yes

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