Probing local structure of rod-like liquid crystals in nanosized confinement with small angle neutron scattering

Wojciech Zając

Institute of Nuclear Physics Polish Academy of Sciences

Intermolecular arrangement of a liquid crystal (LC) confined in a mesoporous matrix is governed by entropic and energetic effects. The former encompass order-disorder phenomena resulting from spatial conditions (sometimes treated in terms of negative pressure), the latter include the interactions between soft matter molecules and the pore walls. Much can be learned indirectly from measuring e.g. relaxation dynamics (cf. e.g. [1] and references therein).

It is therefore tempting to use a more direct experimental method of studying short range order of LC molecules under geometric confinement. Small angle neutron scattering (SANS) is an obvious choice here, as it probes fluctuations of scattering length density (SLD), and thus can be sensitive to the variation of SLD with increasing distance from the cavity walls, as well as that resulting from maxima of spatial correlation function [2]. Other small angle scattering methods can also be mentioned in this context, such as SAXS (this work) or grazing incidence angle X-ray scattering [3]. Fig. 1 illustrates recently measured SANS patterns of three homologues with scattering from membrane subtracted. SANS from the same compounds contained within bigger pores was also measured. The results will be discussed in more detail and compared with SAXS patterns.

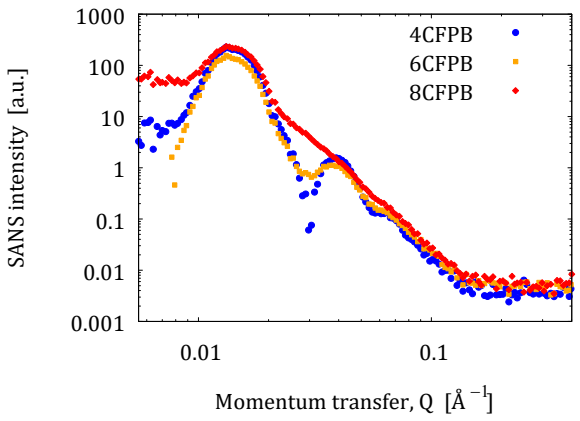

Figure 1 SANS pattern of three homologues confined in SiO_2 nanoporous (18 nm) membrane.

[1] T. Rozwadowski. *The influence of pressure on dynamics and polymorphism of 4-cyano-3-fluorophenyl 4-butylbenzoate,* PhD thesis, IFJ PAN, Kraków, 2016 (in Polish)

[2] Y.B. Melnichenko, Small-Angle Scattering from Confined and Interfacial Fluids, Springer (2016), ISBN 978-3-319-01103-5

[3] S.H. Ryua, H. Ahnb, T. J. Shinc and D. K. Yoona, Liquid Crystals **44** 4 713-721 (2017)