

Complementary Neutron and X-ray Scattering Studies of a Lyotropic Micellar Nematic Phase

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In this study, we investigate the micellar nematic phase of cylindrical micelles formed by the ionic surfactant N,N-dimethyl-N-ethyl-1-hexadecylammonium bromide (CDEAB) in water using complementary scattering techniques, namely small-angle X-ray scattering (SAXS) and small-angle neutron scattering (SANS). These two techniques probe different parts of the micelles because of the specific scattering contrasts in each case [1]. While SANS is primarily sensitive to the hydrocarbon core, SAXS additionally detects the polar headgroups and the counterion cloud, leading to an additional shoulder in the intermediate- q range of the SAXS profile (see Figure 1). In order to gain insights into the dimensions and the internal structure of the micelles, both sets of scattering data are analyzed using the same core-shell cylindrical form factor with Hayter–Penfold rescaled mean spherical approximation (RMSA) structure factor describing rod-like micelles with a hydrophobic core and a hydrated ionic shell in the lyotropic nematic phase.

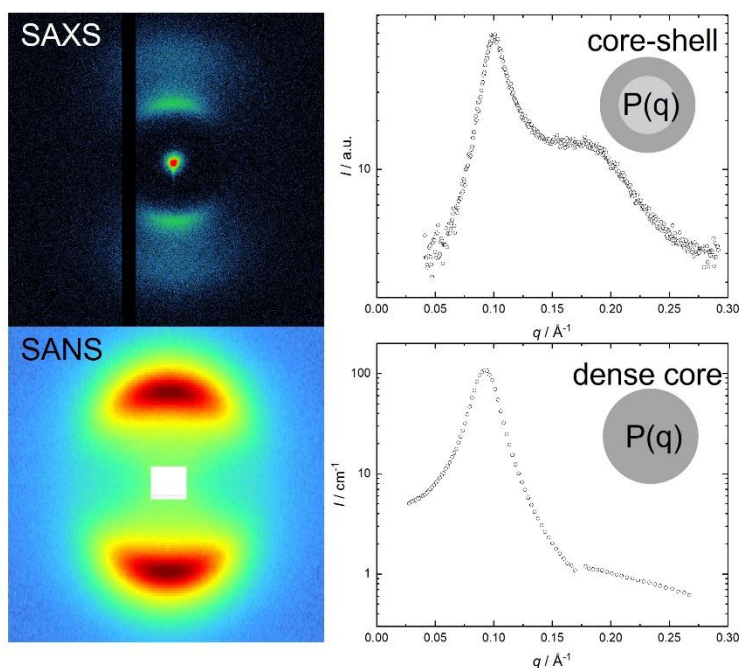


Figure 1. Examples of 2D small-angle X-ray and neutron scattering patterns of the same micellar nematic phase are shown in the left column while the corresponding 1D scattering profiles (intensity I vs. q) are shown in the right column.

References

[1] V. Lutz-Bueno, M. Liebi, J. Kohlbrecher, P. Fischer, *Langmuir* **33**, 2617–2627 (2017).

Acknowledgments

Funding was provided by the Deutsche Forschungsgemeinschaft (DFG GI 243/10 1 / DFG STU 287/7-1).