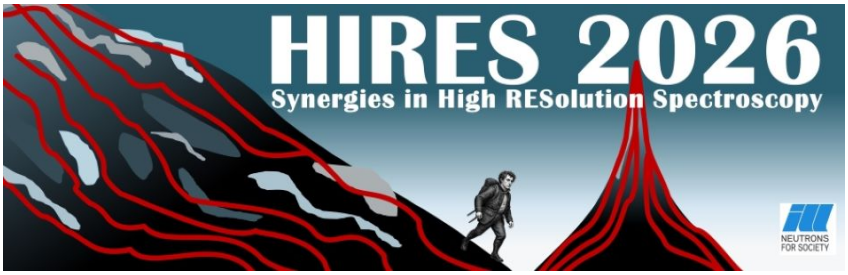

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Describing NSE Data from Undulating Membranes: Recent Advances

The Zilman-Granek (ZG) stretched exponential [1] has been widely used to describe neutron spin echo (NSE) data from undulating membranes for more than 2 decades.
However, with the abilities of modern NSE spectrometers, it becomes necessary to go beyond the stretched exponential approximation.

Recently, we have published an expression for the dynamic structure factor of undulating vesicles, that explicitly takes into account their spherical geometry, their finite size and the effect of translational diffusion [2]. We compare these expressions to NSE data from simple vesicle membranes.

While the traditional stretched exponential yields drastically different values of the bending rigidity for vesicles made from the same type of lipids but extruded to different sizes, our new expression yields consistent results of the effective bending rigidity. However, at q<0.05 1/Å the observed bending rigidity decreases and it becomes apparent that additional effects need to be taken into account. While it is theoretically possible to disentangle these effects, it remains a challenge to do so with current experimental data.

Our expression allows for the consistent description of membrane undulations in terms of an effective bending rigidity wich is independent of the vesicle size. Measuring to sufficiently low q and sufficiently long fourier times, it becomes obvious, that the description in terms of a single bending rigidity is an oversimplification. However, the quantification of the influence of different effects remains difficult.

References

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Session

Soft Condensed Matter

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