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Surface Modes in Phospholipid Membranes

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Phospholipid membranes are the basic construction material of cell membranes. Also, solutions of phospholipid vesicles find a wide array of applications in technical, medical and biological applications.

In our previous publications we showed both the structure and the dynamic behavior of L- α -phosphatidylcholine (SoyPC) phospholipid membranes. [1,2] We established a multi-lamellar structure as well as a surface mode, that we attributed to a standing wave in the membranes.

Following up on this experiment, we performed additional GISANS measurements. We were able to find the coherent scattering contribution of the dynamic modes of the phospholipid membranes with GISANS resolution settings specifically adapted to those features. Moreover, as we assumed the standing wave was linked to a specific phase of the lipid membrane, we investigated the system at different temperatures and could show that the standing wave indeed disappeared at temperatures below 25°C and reappeared when the system was reheated.

After showing the observed standing mode in GINSES experiments is most pronounced at physiological temperatures and vanishes after decreasing the temperature below 25°C we can speculate that this feature of phospholipid membranes is indeed part of the natural function of such membranes in biological systems.

References

[1] S. Jaksch, H. Frielinghaus et al, Phys. Rev. E 91(2), (2015) 022716.

[2] S. Jaksch, H. Frielinghaus et al, Scientific Reports 7(1), (2017) 4417.

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