

Flexibility of Lipid Bilayer Membranes in Ionic Liquids

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Ionic liquids (ILs) are a novel class of solvents with ultra-low vapour pressure and tunable liquid properties. Among them, protic ionic liquids (PILs) are particularly effective solvents for self-assembly of surfactants and lipids into micelles, vesicles, liquid crystals and microemulsions.[1-4] This is exemplified by alkylammonium PILs, which are also cheap, easily-prepared and can be readily deuterated. Over the past decade, much is learnt about the static structure of many ethylammonium PILs,[5] however, virtually nothing is known about their dynamics or of how the underlying nanostructure of the IL solvent affects the dynamic of amphiphile aggregates. In this work, we aim to reveal the effect of solvent nanostructure on flexibility of lipid bilayers. We employed neutron spin echo spectroscopy (IN15, ILL) to probe the mesoscopic undulation of Egg-PC membranes (1 wt% as vesicle dispersions) in ethylammonium formate (EAF) and water. For the first time, IN15 is configured to perform dynamic measurements up to 1000 ns, which is essential due to the much slower motion we observed in PILs. Through the comparison between EAF and water, we are able to elucidate the dominant factor that affects membrane stiffness and stability in ILs, and how EAF nanostructure contribute to the dynamics of large amphiphile aggregates.

1. M.U. Araos, G.G. Warr, J. Phys. Chem. B. 2005, 109, 14275-14277
2. M.U. Araos, G.G. Warr, Langmuir 2008, 24, 9354-9360.
3. R. Atkin and G.G. Warr, J. Phys. Chem. B. 2007, 111, 9309-9316.
4. S.J. Bryant, K. Wood, R. Atkin, G.G. Warr Soft Matter 2017, 13, 1364-1370
5. R. Hayes, G.G. Warr, R. Atkin Chem. Rev. 2015, 115, 6357-6426.

Level of Expertise

Student

Do you wish to take part in the poster slam

Yes

Travel Funding

No

Speakers Gender

Male

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