A COMPARISON OF LIPID NANODISCS (SMALPS) MADE FROM THREE DIFFERENT POLYMERS AND THEIR EFFECTS ON THE EXCHANGE OF LIPIDS WITH LIPID MONOLAYERS

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ABSTRACT

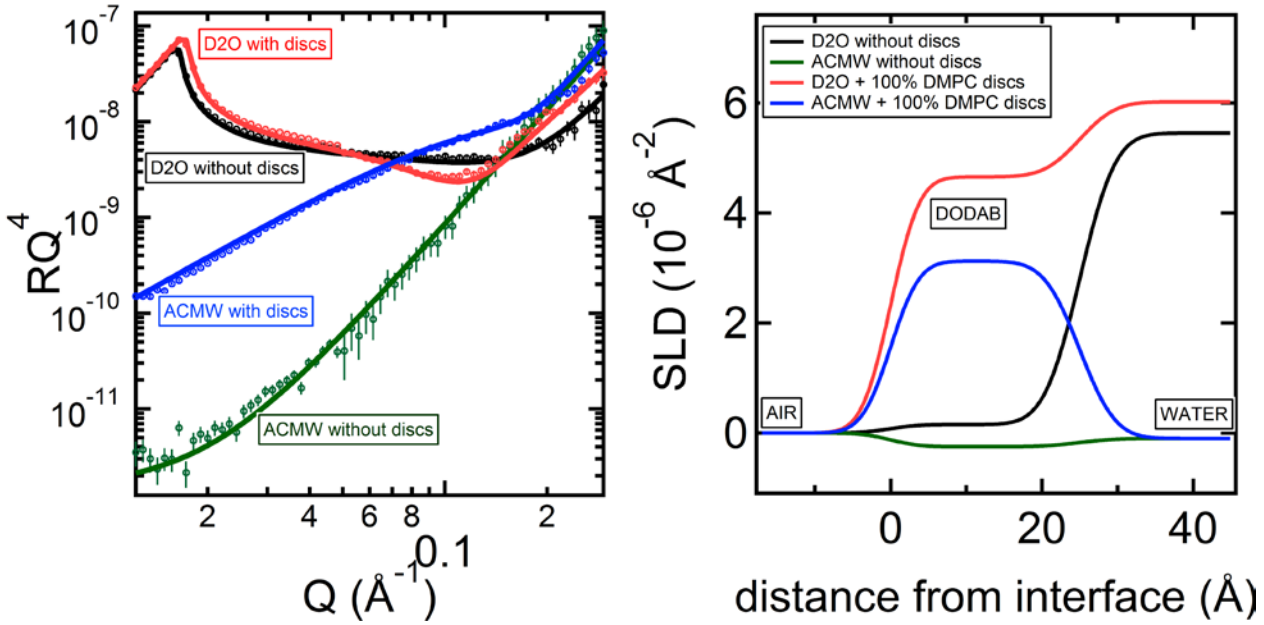

Figure 1: Neutron reflectivity data plotted on the RQ4 scale (left) and Scattering Length Density (SLD) profile (right) for an h-DODAB monolayer on Air-Contrast-Matched-Water (ACMW- dark green) and D_2O (black) buffer contrasts without discs, and on ACMW (blue) and D_2O (red) buffer solution containing 100% d-DMPC nanodiscs. The markers represent the measured reflectometry data, and the lines show the calculation from the model SLD profiles shown.

Styrene-maleic acid lipid particles (SMALPs) are self-assembled discoidal structures composed of a polymer belt and a segment of lipid bilayer, which are capable of encapsulating membrane proteins directly from the cell membrane. Here we will present a comparative study showing how different nanodisc forming polymers influence the properties of the discs formed. We will present details on three different polymers: the commonly used poly(styrene-co-maleic acid) SMA2000P copolymer, a poly(styrene-alt-maleic acid) made using a RAFT controlled polymerization technique and a poly(styrene-co-maleimide) SMI2000 copolymer. As well as a comparison of the physical properties of the discs and the thermodynamics of their formation, we will highlight some interesting differences between the polymers seen while examining their lipid exchange properties. We have recently demonstrated evidence of the exchange of lipids between discs made from the RAFT-polymer and lipid monolayers adsorbed at either solid−liquid or air−liquid interfaces[1] (see Fig. 1). We have now investigated this process in more detail for each of the three polymers mentioned above. Lipid exchange is seen in each case but the kinetics and extent to which this occurs are considerably different for each polymer. This behaviour may have important implications for the potential uses of nanodiscs made from different polymers.

References:

1. Hazell, G., et al., *Evidence of Lipid Exchange in Styrene Maleic Acid Lipid Particle (SMALP) Nanodisc Systems.* Langmuir, 2016. **32**(45): p. 11845-11853.