Experimental report

24/09/2024

Proposal: **INTER-581** **Council:** 4/2023

Title: Probing small molecules interactions with thin lipid films

Research area:

This proposal is a new proposal

Main proposer: **Ben HUMPHREYS**

Experimental team: Ben HUMPHREYS

Local contacts: Ben HUMPHREYS

Samples: Lipid (triolien, DOTAP, DOPC) lipase (TLL), polymer (deuterated PS)

Instrument	Requested days	Allocated days	From	To
D17	2	2	05/06/2023	07/06/2023

Abstract:

Exp. INTER-581 "probing small molecules interactions with thin lipid films"

Exp. Team: B. Humphreys

Local Contact: B. Humphreys

This experiment aimed to study the interactions of small molecules with well-defined lipid bilayers prepared from two different combinations of lipids.

Sample one was prepared with the following mixture:

70%[99.5%(DGMO(25):DOPC(15):GMO(60))0.5%DOTAP]+30% P80

Sample two was prepared with the following mixture:

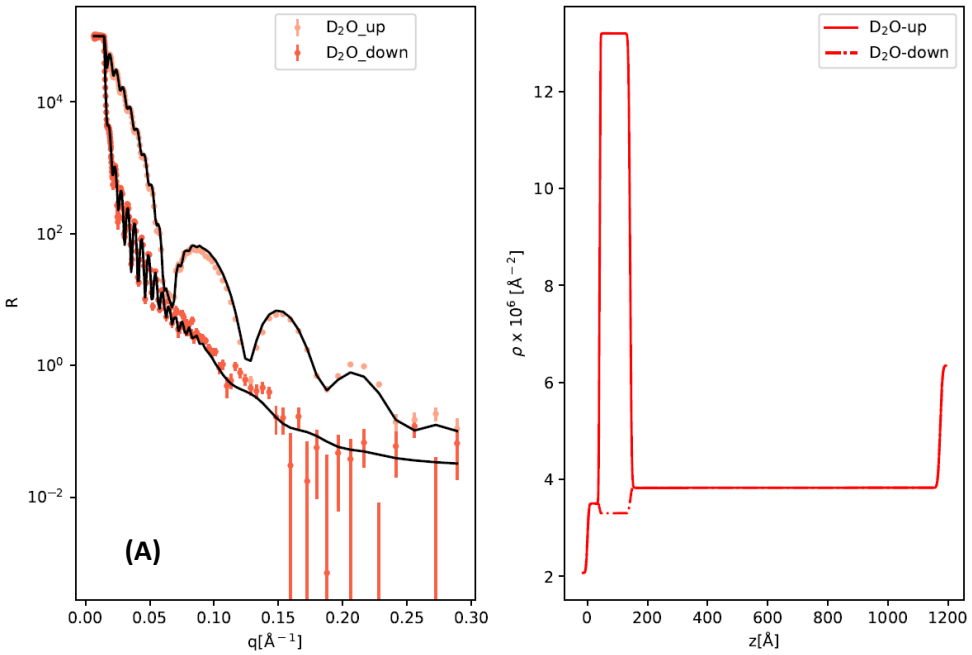
70%[DGMO(25):DOPC(15):GMO(60)]+30% P80

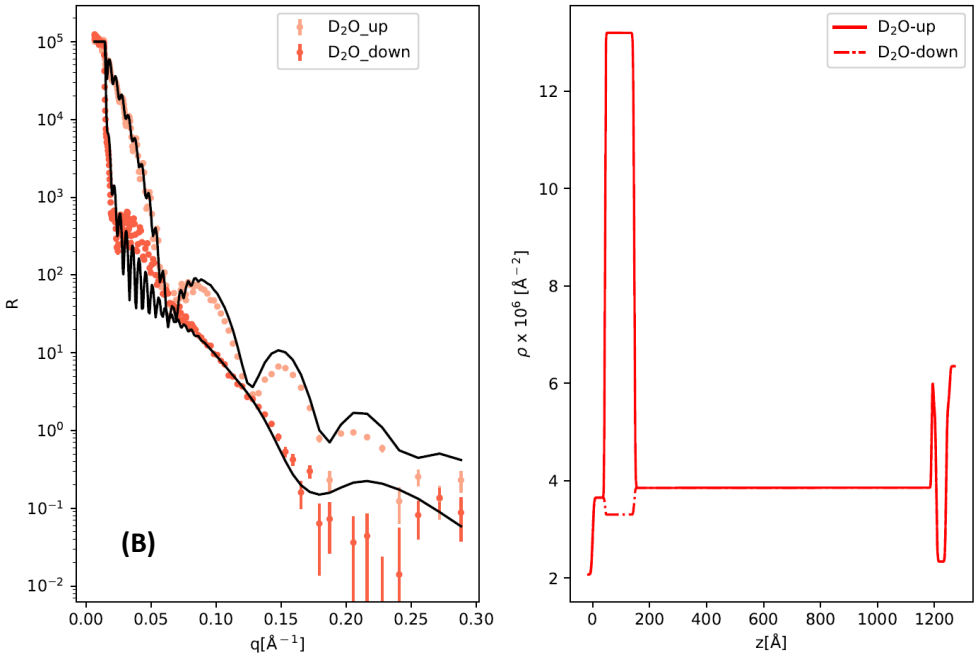
These films were prepared on special silicon blocks with an iron layer (~100 Å) between the silicon substrate and a capping silica layer (~1000 Å). Ideally, this would allow the use of polarised neutrons to provide two contrasts for each conditions without changing solvents which can potentially disrupt/rearrange the structure of the thin film.

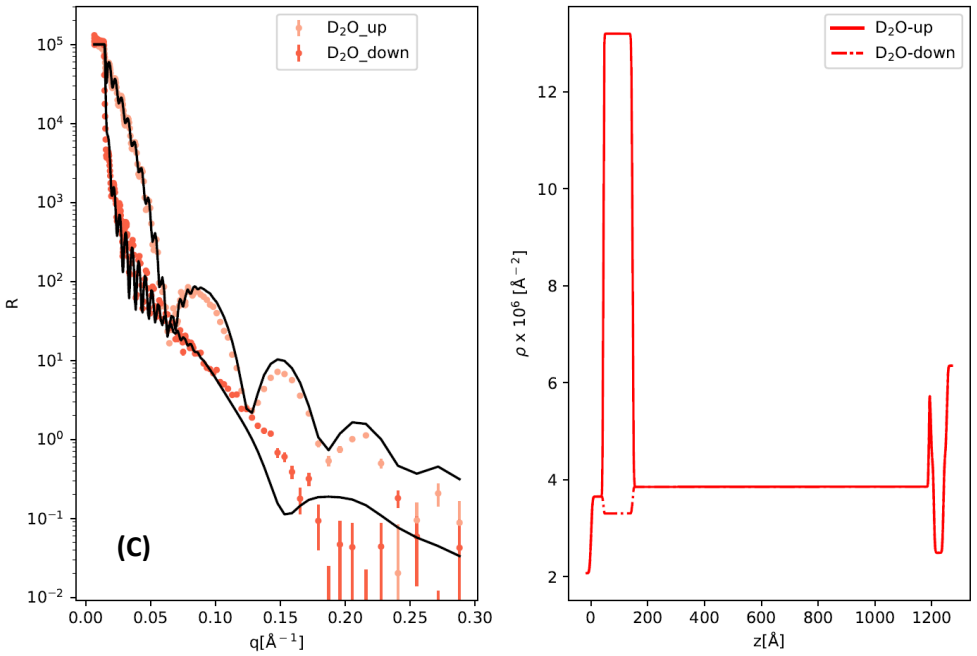
Sadly, it appears that the silica cap layer had become porous over time, allowing the iron layer to oxidise. This significantly impacted the coverage of the lipid bilayer on the surface, rendering the data unusable.

Below, are polarised neutron reflectivity profiles with fits for the spin up and spin down measurements for (A) the bare silicon/iron block, (B) lipid 1 coating, and (C) lipid 2 coating.

The fits indicate that the surface coverage was only around 60% for both lipid compositions (B and C).




D2O_up
D2O_down
R
q[Å⁻¹]
(B)
D2O-up
D2O-down
ρ x 10⁶ [Å⁻²]
z[Å]


D2O_up
D2O_down
R
q[Å⁻¹]
(C)
D2O-up
D2O-down
ρ x 10⁶ [Å⁻²]
z[Å]