Supplementary Information

Results

Formation of the lipid bilayer

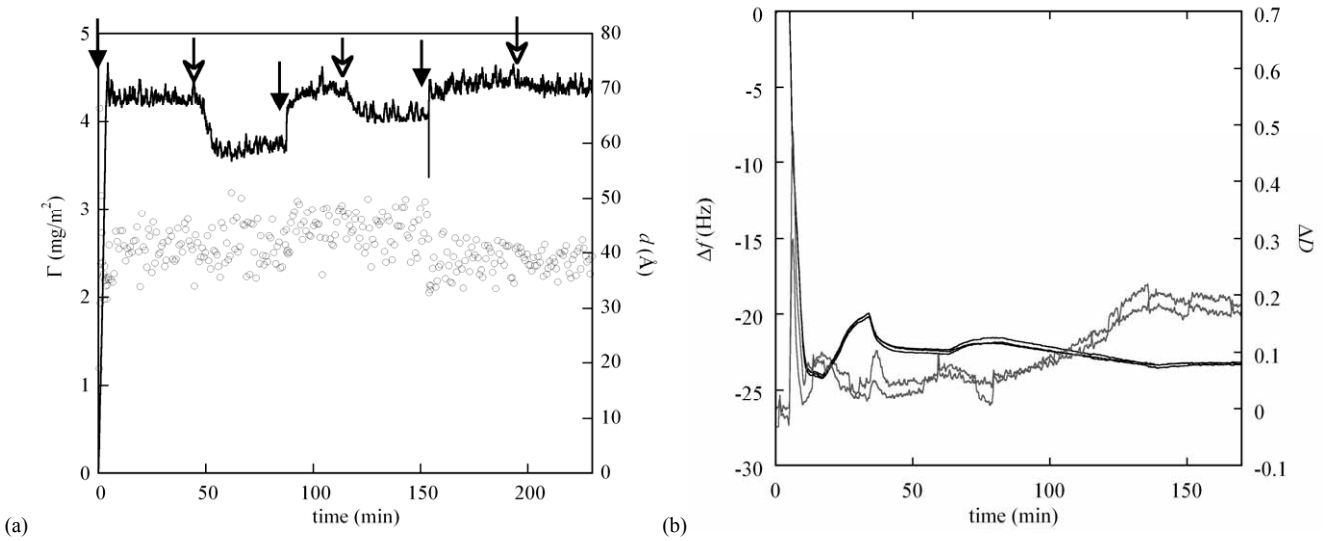

Figure S1. (a) Adsorbed amount Γ (solid line) and layer thickness *d* (open symbols) determined by ellipsometry and (b) frequency shift Δ*f* (black lines) and dissipation difference Δ*D* (grey lines) as determined by QCM-D as a function of time during the process of DOPC bilayer formation on silica. The different lines in the QCM-D plot, which are in very close agreement, correspond to the 3rd and 7th harmonics.

Figure S1 shows the ellipsometry (Figure S1a) and QCM-D (Figure S1b) data obtained during the formation of the DOPC bilayer. Ellipsometry results show that the bilayer thickness is ~ 40 Å and the adsorbed amount is ~ 4.2 mg m^{-2} after the procedure is completed (t > 200 min). We note that the first rinse (t = 45 min) results in a significant decrease in adsorbed amount, while the layer thickness does not change. The fraction of material that is removed decreases with each sequential rinse of DOPC–DDM until there is no reduction in the adsorbed amount after the last rinsing step. This behaviour indicates that the amount of soluble material (i.e. DDM) decreases with each step, and after the final step a complete DOPC bilayer is obtained. The values of adsorbed amount and layer thickness, as well as the kinetics, are consistent with earlier studies.[1-3] The frequency shifts observed by QCM-D show the same trends, and the values are independent of the harmonics of the resonance frequency investigated. This observation indicates that the Sauerbrey equation for homogeneous rigid film is applicable in this case.

Interaction of CPNPs with a supported lipid bilayer

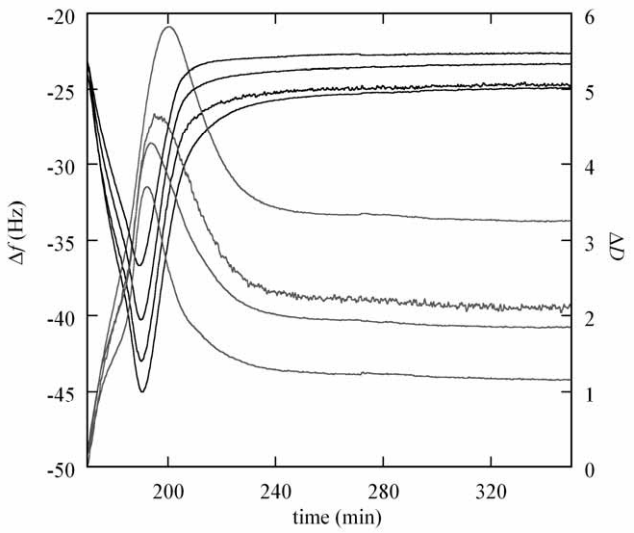

Figure S2: Frequency shift Δf (black lines) and dissipation difference ΔD (grey lines) determined by QCM-D as a function of time after the addition of CPNPs at a concentration of 0.05 mg mL^{-1} to a DOPC bilayer at pH 4. The frequency shifts and dissipation differences are shown for the overtone numbers o_n = 3, 5, 7 and 13, where the largest changes in Δf and ΔD are observed for o_n = 3 and the smallest changes for o_n = 13.

Figure S2 shows the frequency shift and dissipation difference as obtained from QCM-D measurements. Large discrepancies are observed for the values of the two parameters for the different harmonics investigated. In this case, the Sauerbrey equation cannot be used to calculate the wet mass of material at the silica surface, and a model taking into account the viscoelastic properties of the adsorbed layer is needed, such as the Voigt representation.

References

1. L. M. Grant and F. Tiberg, *Biophysical Journal*, 2002, **82**, 1373-1385.
2. H. P. Vacklin, F. Tiberg, G. Fragneto and R. K. Thomas, *Biochemistry*, 2005, **44**, 2811-2821.
3. H. P. Vacklin, F. Tiberg, G. Fragneto and R. K. Thomas, *Langmuir*, 2005, **21**, 2827-2837.