

LIPID BILAYER FORMATION USING THE Q-SENSE OPEN MODULE

The Q-Sense Open module (QOM 401) enables direct access to the sensor surface and is compatible with the Q-Sense E-series systems. The module endows low volume analysis, viscosity measurements and studies of polymerization processes. Here, we describe the experimental approach to form a mixed lipid bilayer using the Open module.

BACKGROUND

Vesicles adsorbing to silica surfaces rupture into bilayers [1]. These bilayers are commonly used as a mimic for cell membranes and subsequent downstream analysis such as protein or peptide interactions. Using QCM-D to study the bilayer formation provides valuable real-time information about the membrane structure, the amount of adsorbed lipids and the interaction with biomolecules.

EXPERIMENTAL LAYOUT

In this technology note we report the use of the Open module (Figure 1) to form lipid bilayers (75% Palmitoyl oleoyl phosphatidyl choline, POPC, 25% palmitoyl-oleoyl phosphatidylserine, POPS) on a silica surface in a stagnant mode. The QCM-D response for the formation of the lipid bilayers is displayed in Figure 2. The final volume over the sensor was 300 μ l [2].

- 1 A Q-Sense SiO₂ sensor (QSX 303) was UV-ozone cleaned two times for a period of 15 minutes
- 2 The sensor was inserted into the Open module and the module was run in an E4-system
- 3 300 μ l of PBS buffer (+ 5 mM MgCl₂) was pipetted onto the sensor surface and a stable baseline was acquired
- 4 Liposomes (100 μ g/ml) were prepared in buffer
- 5 300 μ l of liposome solution was pipetted onto the sensor and mixed by pipetting 5 times. Total volume over the sensor was 600 μ l
- 6 Rinsing was performed by sequential removal and addition of 300 μ l buffer

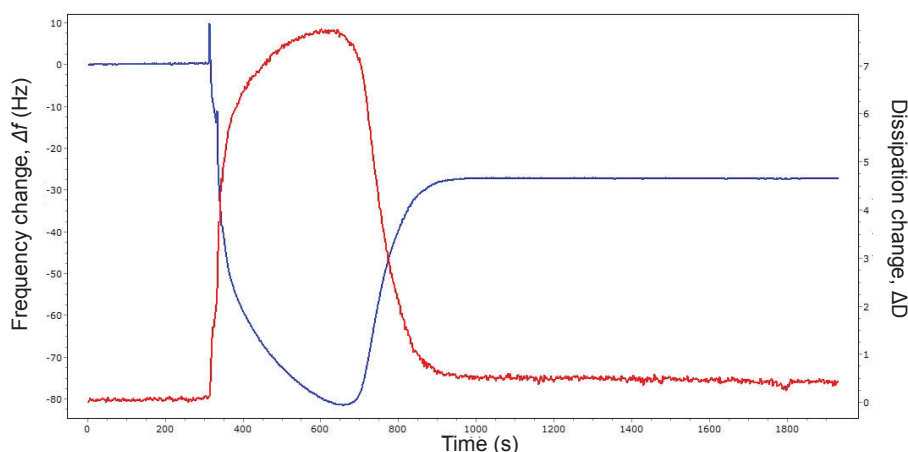
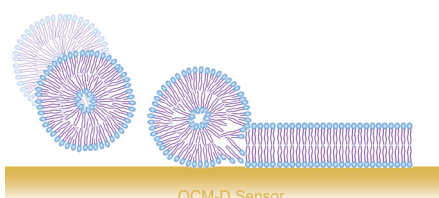


FIGURE 2. QCM-D data for the formation of lipid bilayers on a silica sensor using the Q-Sense Open module. Change in frequency (Δf) is depicted in blue and the change in dissipation (ΔD) in red. A decrease in Δf relates to mass uptake and a decrease in ΔD relates to increased rigidity of the layer. Re-used from [2] with permission.



FIGURE 1. The Q-Sense Open module is suited for pipetting directly onto the sensor surface.

CONCLUSIONS

It is shown here that lipid bilayer formation can successfully be monitored in real-time in a stagnant mode using Quartz Crystal Microbalance with Dissipation monitoring. The experimental approach of using the Open module and pipetting for QCM-D measurements gave the typical QCM-D response known for bilayer formation, Δf of 25 Hz and a ΔD of 0.5 [1].

REFERENCES

- [1] Reimhult, E., Zäch, M., Höök, F., Kasemo, B, *A multitechnique study of liposome adsorption on Au and lipid bilayer formation on SiO₂*, Langmuir, 22(7), 3313–3319 (2006).
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