Asymmetric lipid transfer between zwitterionic vesicles by nanoviscosity measurements

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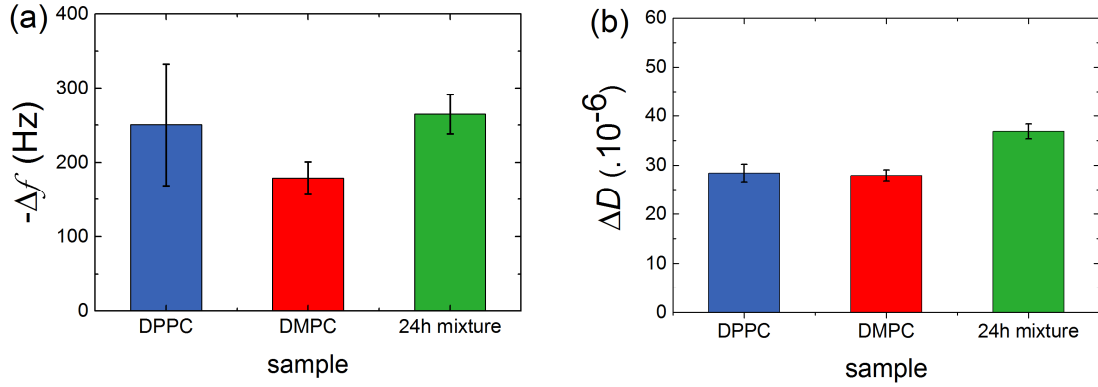
Figure S1. Frequency shifts (a) and dissipation shifts (b) for the third overtone observed during the adsorption of pure DMPC (red), pure DPPC (blue) and 24h DPPC/DMPC mixture (green) at 32°C on Au quartz sensors.
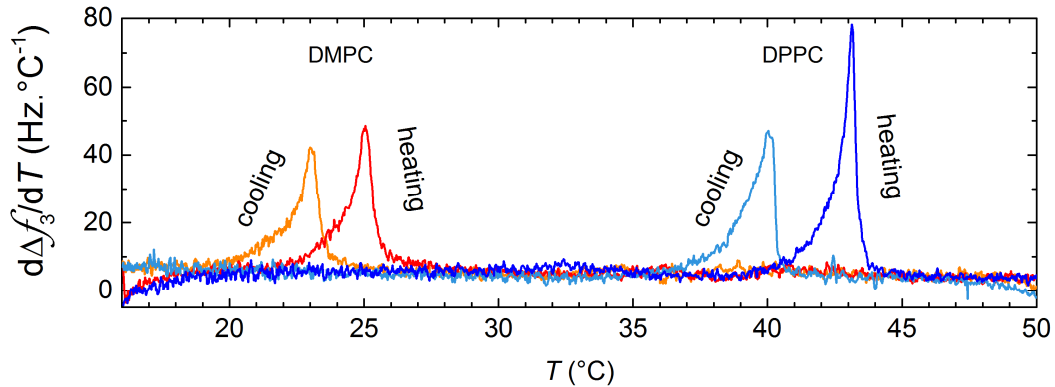
Figure S2. Temperature dependence of $d\Delta f/dT$ (3rd overtone) upon cooling and heating for pure DMPC LUVs and pure DPPC LUVs adsorbed at 50°C on Au-coated quartz surfaces. Upon cooling the phase transitions occur at lower temperatures than upon heating. Here, $|\Delta T_m$ (DPPC)$| = 3.1°$ C, and $|\Delta T_m$ (DMPC)$| = 2.1°$ C.
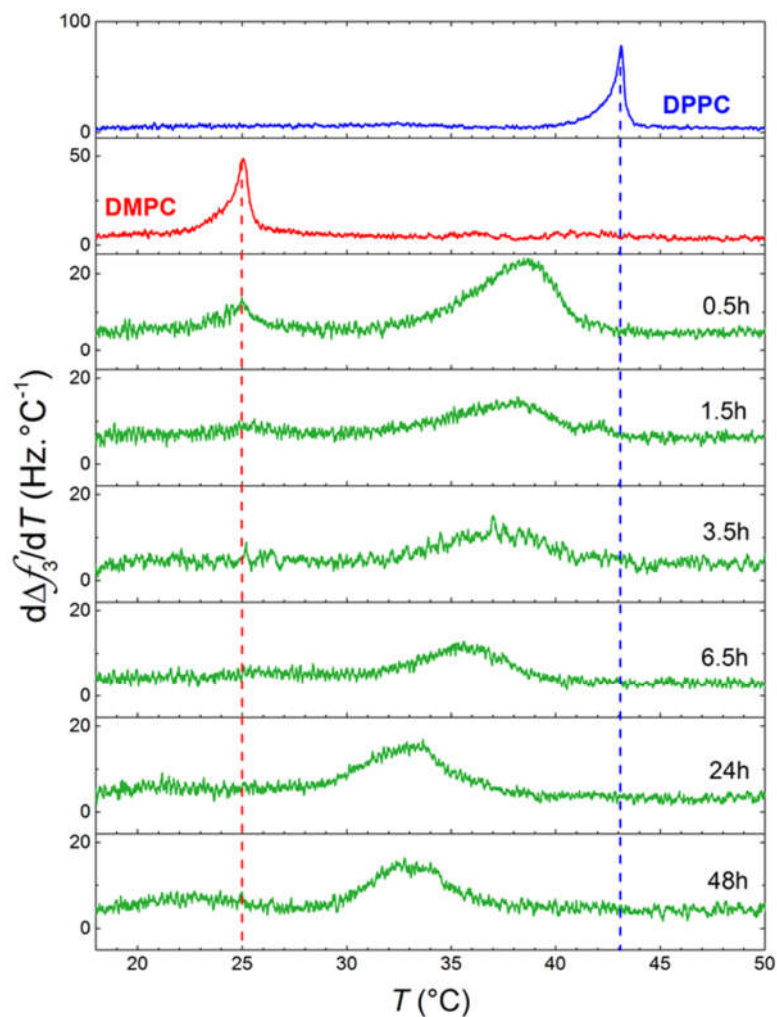

Figure S3. Dependence of the mixing time (30 min, 1h30, 3h30, 6h30, 24h, or 48h) on the main phase transition temperature of adsorbed vesicles on Au-coated quartz surfaces. $d\Delta f_3/dT$ curves (for the 3rd overtone) obtained upon heating demonstrate the phase transitions of samples incubated at 50 °C.
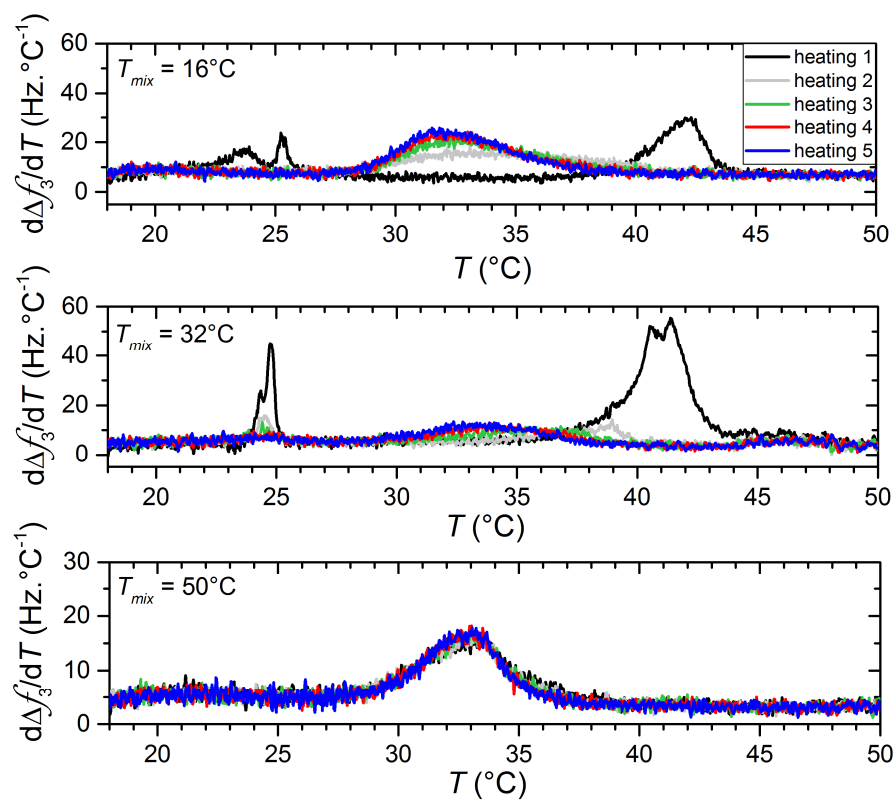
Figure S4. dΔf/dT curves obtained from successive heatings of the DPPC and DMPC vesicle dispersions incubated for 24h at T = 16 °C (top layer), T =32 °C (middle layer), and T = 50 °C (bottom later).
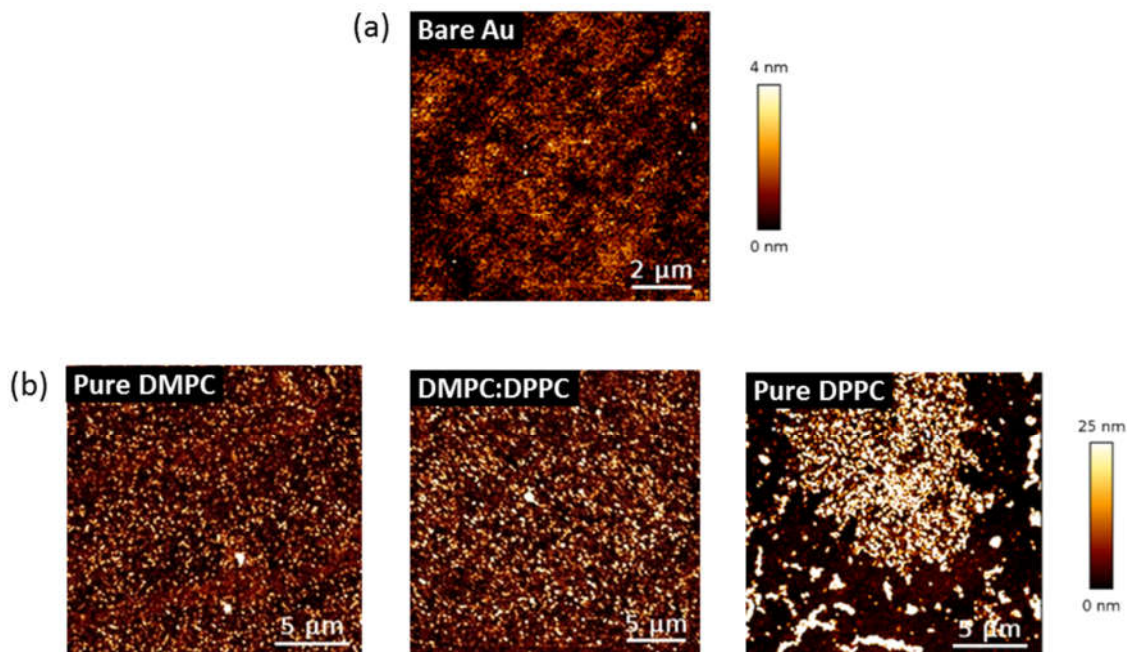
Figure S5. AFM height measured images taken on QCM-D quartz gold sensors : (a) is a bare Au used as reference, (b) is from left to the right pure DMPC, DMPC:DPPC incubated at 50 °C for 24 h and pure DPPC coated surfaces after thermal cycles.
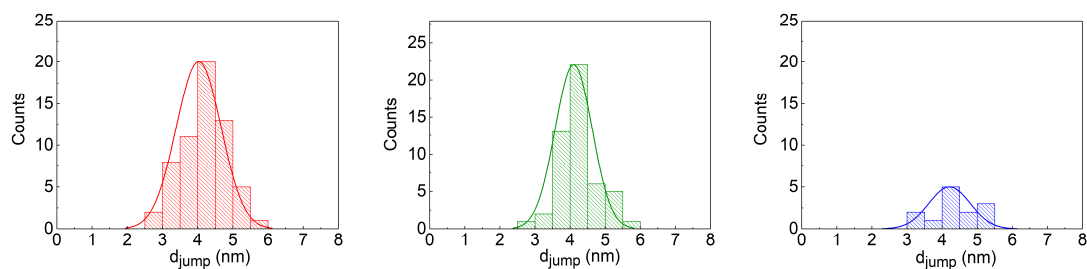
Figure S6. Statistical analysis of the jump thickness upon lipid bilayer perforation. The histograms correspond to a given number of force curves taken on DMPC (red solid line), DMPC:DPPC (green solid line) and DPPC (blue solid line) supported lipid bilayers on Au-coated QCM-D sensors.