

Supporting information paragraph for:

“Phase transitions in adsorbed lipid vesicles measured by Quartz Crystal Microbalance with Dissipation monitoring”.

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The supporting information shows QCM-D data for a temperature sweep using a blank crystal (Fig. S1). This response was subtracted from the response obtained upon sweeping the temperature in the presence of adsorbed lipid vesicles (see Fig. 1 in the main text). Figure S2 shows the QCM-D response upon adsorption of DTPC lipid vesicles at 11°C and 17°C, respectively, and Fig. S3 shows temperature sweeps for adsorbed DTPC lipid vesicles initially adsorbed at either 11°C or 17°C. Figure S4 shows the same type of QCM-D data as in Fig 1a in the main text and Fig. S3 for adsorbed POPC lipid vesicles, with a phase transition temperature of around -2°C. Figure S5 shows DLS data for suspended DTPC lipid vesicles at 11, 14 and 17°C.

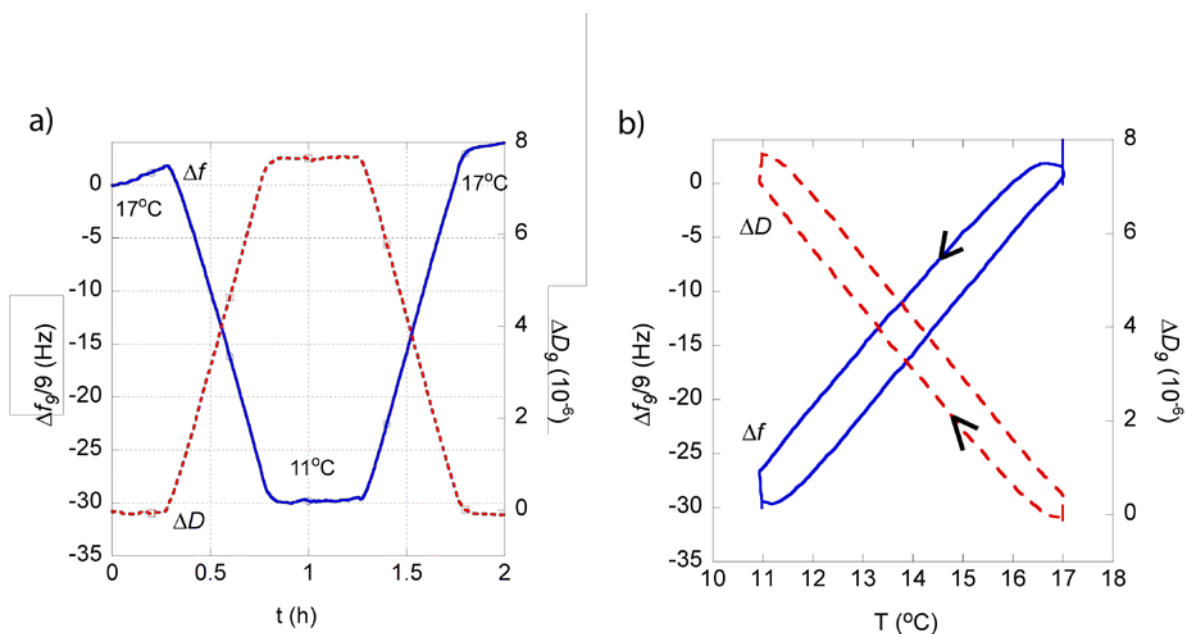


Figure S1. A reference measurement with blank sensors exposed to buffer liquid during a complete temperature loop, as described in the paper as a function of time (a) and a function of temperature (b). Frequency and dissipation responses for the ninth resonance are shown. In (b) the arrowheads indicate the direction of the scan.

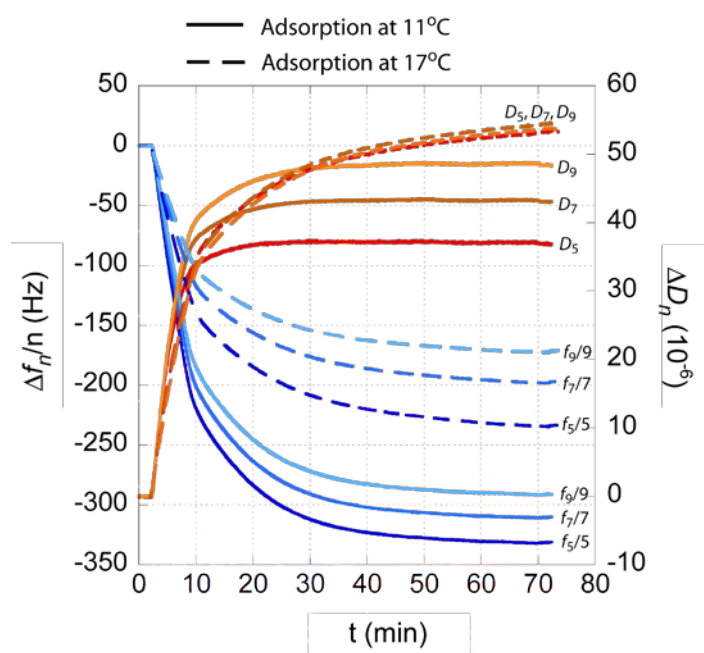


Figure S2. QCM-D data for adsorption of DTTPC vesicles in liquid phase at 11°C (solid lines) and 17°C (dashed lines) on TiO₂. Vesicle concentration: 150 $\mu\text{g/ml}$. The frequency shift is larger and the dissipation shift smaller when the vesicles are adsorbed in gel phase, compared to liquid phase. This is in good agreement with the changes observed by varying the temperature for immobilized vesicles (see Fig. 1 in the main text and Fig. S3 below).

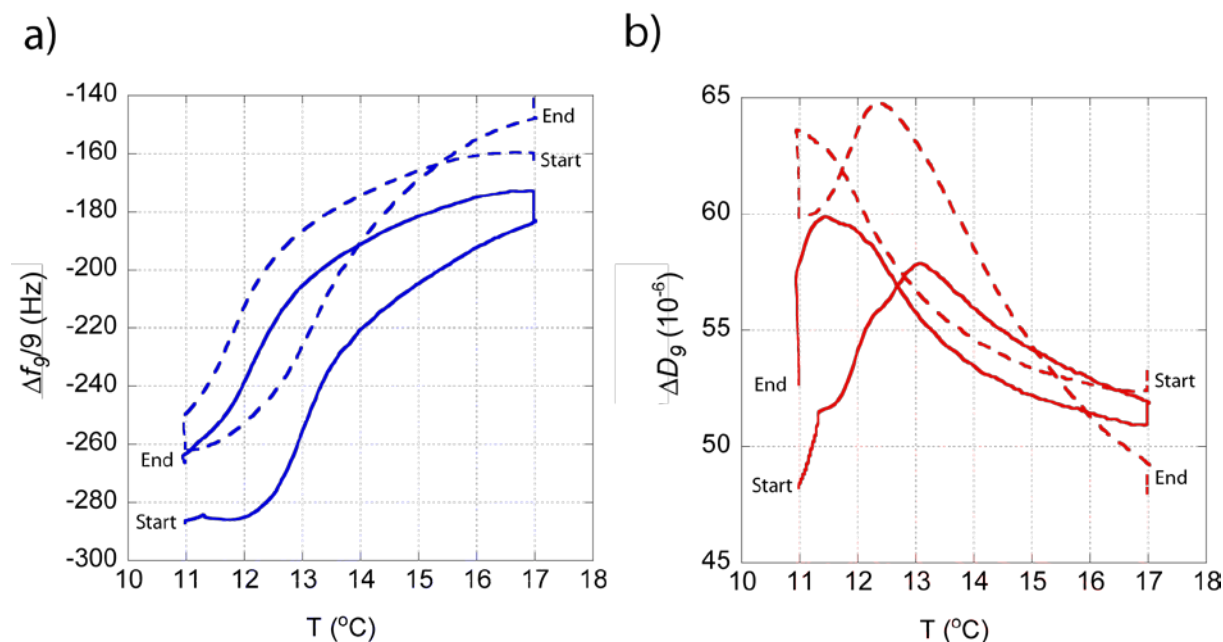


Figure S3. Comparison between changes in (a) f and (b) D versus T during a temperature scan from 11°C to 17°C and back to 11°C (solid lines) and from 17°C to 11°C and back to 17°C (dashed lines), at a scan rate of 0.2°C/min, just after immobilization of DTTPC vesicles (see Fig. S2). The bulk response (see Fig S1) has been subtracted.

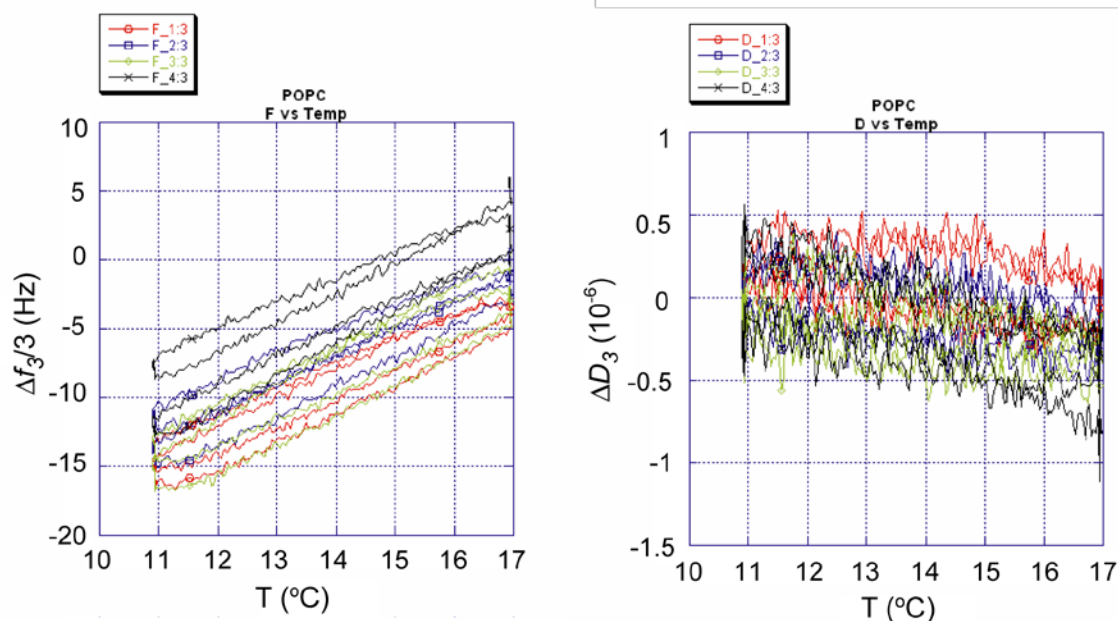


Figure S4. Changes in (a) f and (b) D versus T for adsorbed POPC-vesicles under the same conditions as the DTPC above (four measurement chambers probed simultaneously). Since $T_g = -2^\circ\text{C}$, no phase transition is present and the changes in frequency and dissipation response are considerably smaller than in the DTPC case. The scan rate used was $0.2^\circ\text{C}/\text{min}$.

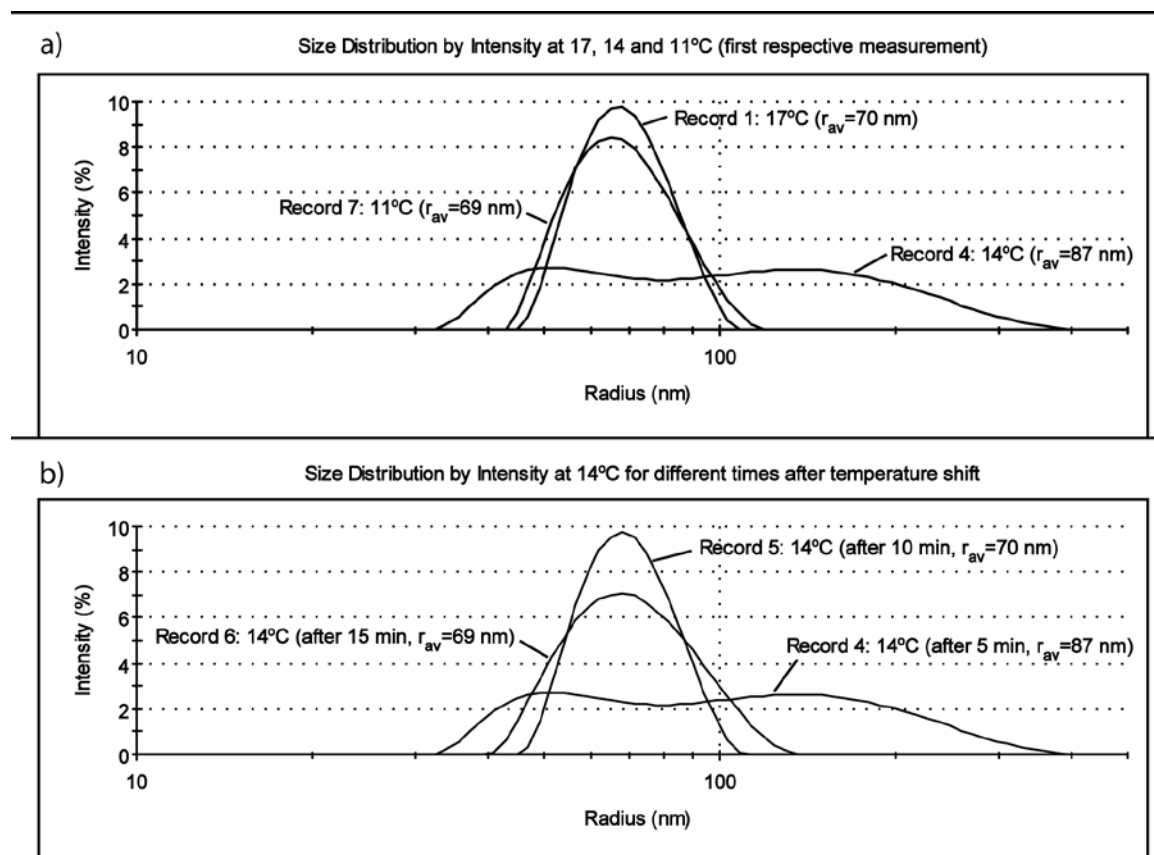


Figure S5. DLS intensity curves for suspended DTPC vesicles undergoing a liquid to gel phase transition. The top figure (a) illustrates the size distribution at 17°C (liquid phase), 14°C (around the phase transition) and 11°C (gel phase). The size distribution is essentially equal in liquid phase compared to gel phase, which supports the modelled QCM-D data (see main text). Around T_g , the distribution broadens significantly with a larger average radius, probably due to size fluctuation and domain formation (see main text). The bottom figure (b) shows the size distribution of DTPC vesicles at 14°C at different times after the temperature shift from 17°C. The distribution tends to stabilize and approach that of the gel phase as time proceeds. A similar behaviour was observed when crossing T_g from low towards high temperature. These data serves as a reference for Fig. 2b in the main text.