Imidazolium salts mimicking the structure of natural lipids exploit remarkable properties forming lamellar phases and giant vesicles

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Supporting Information

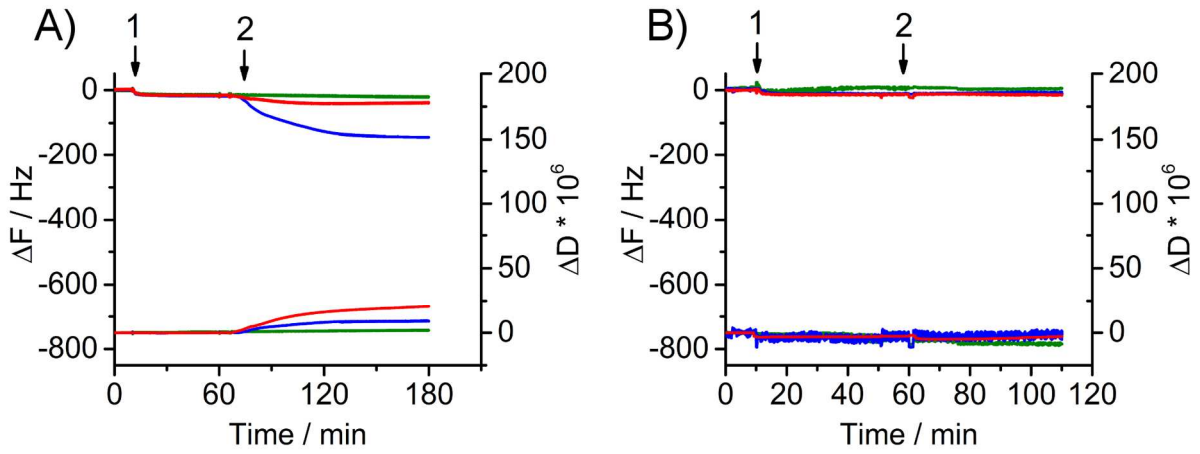

Figure S1: Incubation of imidazolium salts on streptavidin.
Incubation of 1,3-dimethyl-4,5-dialkylimidazolium and 1,3-dibenzyl-4,5-dialkylimidazolium compounds on a streptavidin layer probed by QCM. A biotinylated self-assembled monolayer ($A_{OH}/A_{COOH}/B_{Biotin}$; 40:10:1) was prepared on a gold coated sensor overnight, rinsed by TBS buffer and then incubated by 0.15 µg/ml streptavidin (arrow 1). After rinsing with TBS buffer again, 0.1 mM imidazolium salt suspensions were incubated (arrow 2). The sensors frequency shifts are small in comparison to the effect these salts induced on tethered liposomes. A) C_n-IMe·HI, B) C_n-IBn·HBr. C_{15}- imidazolium salts: red graph, C_{11}- imidazolium salts: blue, C_7-imidazolium salts: green. Upper curves: frequency, lower curves: dissipation.

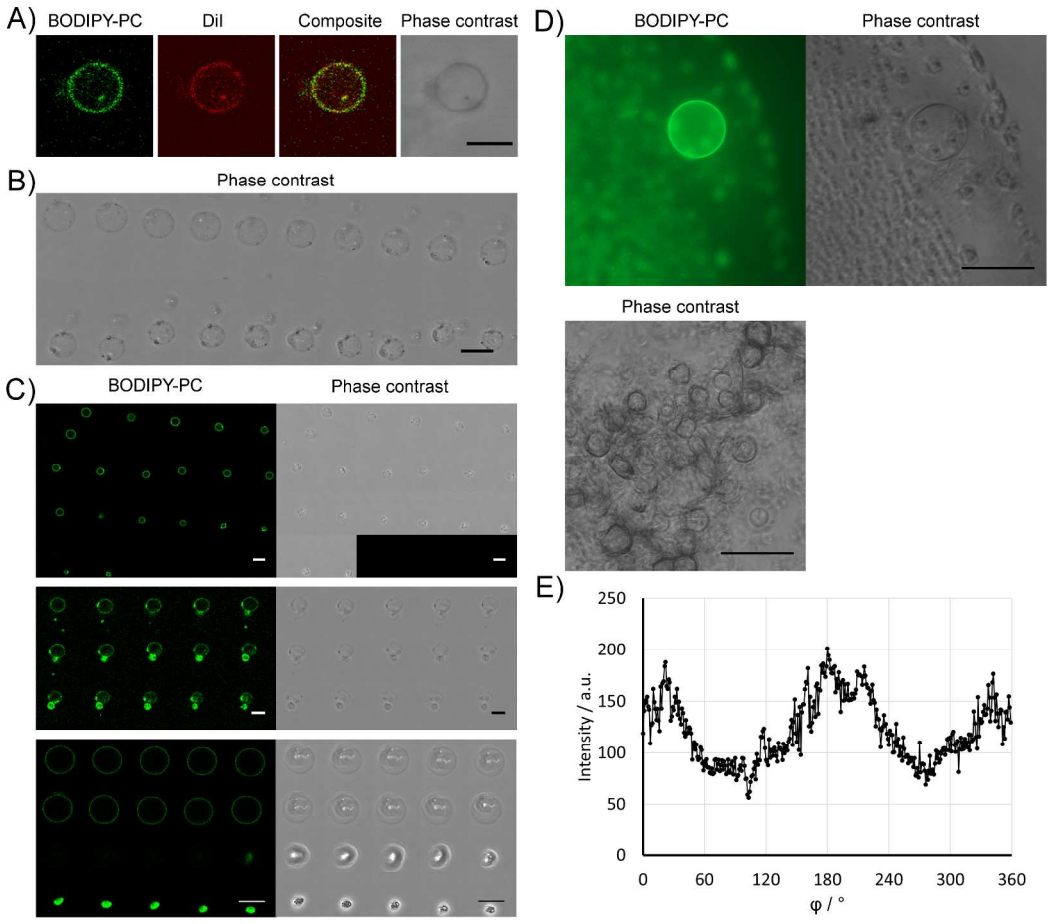

Figure S2: GUVs prepared from C_{15}-IMe·HI and C_{11}-IMe·HI.
A) C_{15}-IMe·HI-GUV prepared in 320 mM sucrose on PVA, diluted 1:4 by HBS pH 7.4 buffer remain stable for at least 90-120 min. Scale, 5 µm. B) Phase contrast image of the C_{11}-IMe·HI vesicle displayed in figure 4 C, scale 10 µm. C) Examples of shrinking, thermodynamic instable C_{11}-IMe·HI GUVs, times: upper 133s, middle: 54s and lower: collapse after 27s. Scales 10 µm. D) C_{15}-IMe·HI-GUVs with 0.2 % BODIPY-PC, swollen on PVA in HBS pH 7.4. Wide-field images in D) employed an EVOS^{TM} FL cell imaging system, scales 50 µm. E) Angular (φ) dependency of the fluorescence intensities along the vesicle circumference shown in Figure 4 A.

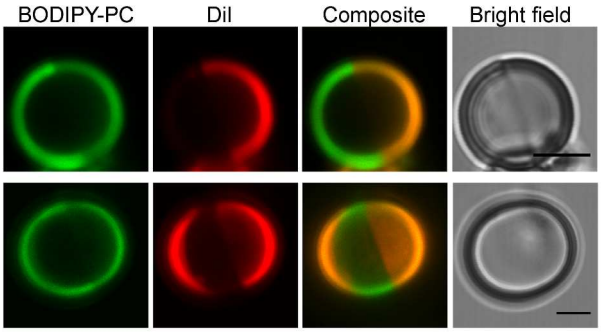

Figure S3: GUVs of DOPC/PSM/Chol (33:33:33).
GUVs of DOPC/PSM/Chol (33:33:33) prepared in HBS buffer. Upper row: Equatorial slices at T = 20.4°C, lower row at T = 22.2°C. The composite image of row 2 represents a 2D projection of a 3D reconstruction of several CLSM z-slices. GUVs were doped with 0.4 mol % BODIPY-PC and 0.4 mol % DiI_{C18}. Scales = 5 µm.

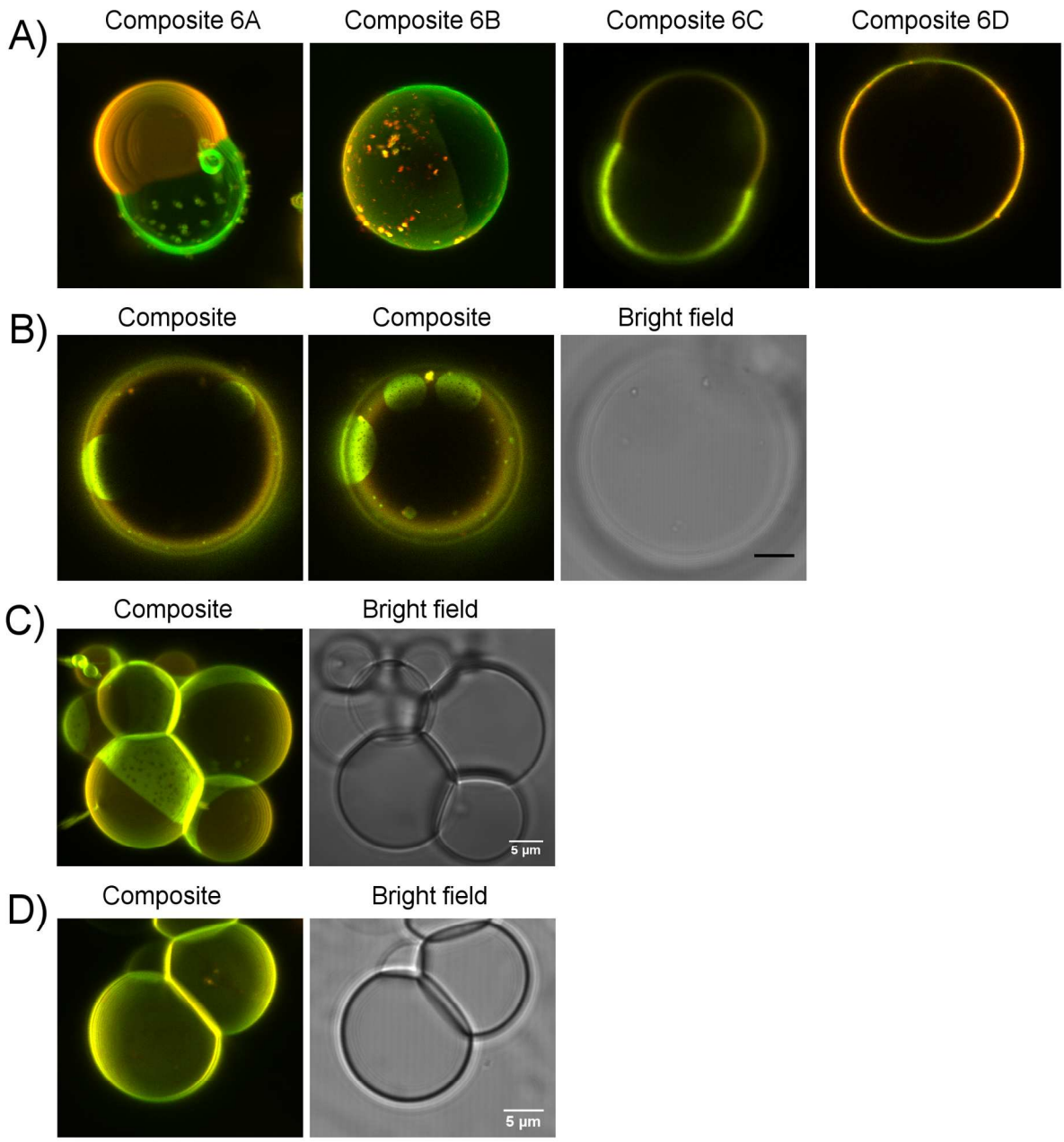

Figure S4: Membrane fluidization of C_{15}-IMe·HI.
A) 2D projections of 3D reconstructions of several CLSM z-slices from the GUVs shown in Figure 6 A and B as well as equatorial slices of the GUVs shown in Figure 6 C and D. Note the difference in line tension between domains and the difference in domain appearance. The structures on the vesicle surface in composite 6 B are surface attached membrane debris and do not represent phase domains. B) GUVs of DOPC/DSPC/Chol (33:33:33) at T = 22.8 °C, scale = 10 µm. The second composite highlights domains on the upper hemisphere of the GUV. Due to vivid domain fluctuations and fusion, no 3D reconstruction could be obtained. C) Attached GUVs of DOPC/DSPC/Chol (33:33:33) showing domains at T = 22.9 °C, scale = 5 µm. D) GUVs of DOPC/DSPC/Chol/C_{15}-IMe·HI (33:23:33:10) at T = 22.3 °C,

scale = 5 µm. Note the difference in homogeneity. GUVs were doped with 0.4 mol % BODIPY-PC and 0.4 mol % DiI_{C18}.

Supplemental Videos:
Supplemental Video 1: Shrinking GUV of thermodynamic instable C_{11}-IMe·HI (Figure 4 C).
Supplemental Video 2: Fluidized GUV of DOPC/SM/Chol/C_{15}-IMe·HI (33:23:33:10) doped with BODIPY-PC and DiI_{C18} as shown in Figure 6 F).