Electronic Supplementary Material (ESI) for Soft Matter.

Temperature and Pressure Tuneable Swollen Bicontinuous Cubic Phases Approaching Natures Length-scales

Electronic Supplementary Information

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Lattice parameter results for MO:DOPG 95:5 mol%

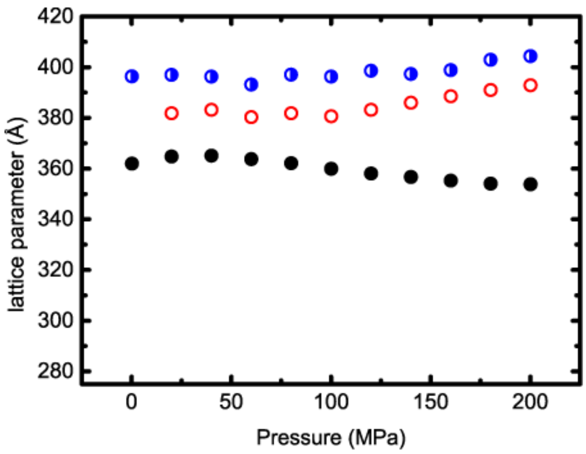

Figure S1. Effects of temperature and pressure on the lattice parameter of a swollen bicontinuous cubic phase Im3m composed of MO:DOPG 95:5 mol% shown at 35°C (●), 45°C (○), 55°C (◐). Error bars are approximately the size of the data points.

Lattice parameter results for MO:chol:DOPS 75:15:10 mol%

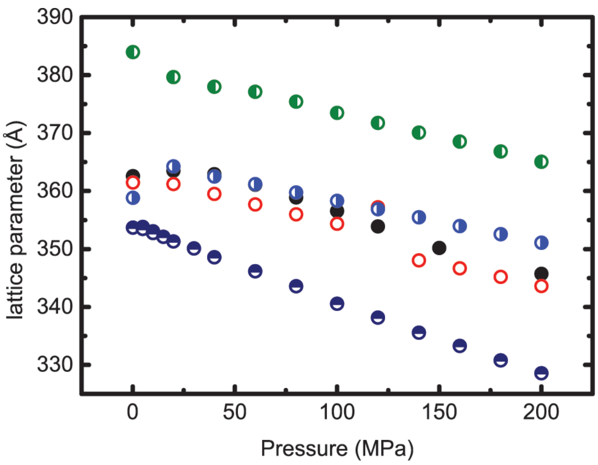

Figure S2. Effects of temperature and pressure on the lattice parameter of a swollen bicontinuous cubic phase Im3m composed of MO:chol:DOPS 75:15:10 mol% shown at 25°C (◒), 35°C (●), 46°C (○), 55°C (◐), 65°C (◐). Error bars are approximately the size of the data points.

Calculation of water content of Im3m cubic phases

The constant mean curvature model[1] (eq. 1) can be used calculate the water volume fraction from the measured lattice parameter. This can then be converted to obtain a w/w hydration (eq. 2)

$$a = 2\sum_{i=0} \frac{\sigma_i\left[\left(\frac{v_n}{V}\right)(1-\emptyset_W)\right]^{2i}}{\left(\frac{A_n}{V}\right)(1-\emptyset_W)} \qquad (1)$$

$$\emptyset_W = \frac{c_W}{c_W+(1-c_W)\left(\frac{\rho_W}{\rho_L}\right)} \qquad (2)$$

Where:
a is the lattice parameter
v_n is the molecular volume between the minimal surface and the pivotal surface
A_n is the molecular area at the pivotal surface
V is the molecular volume
φ_W is the water volume fraction
σ_i are coefficients tabulated for Im3m in reference 2.
c_W is the water content (by weight)
ρ_W is the density of water
ρ_L is the density of the lipid

We have directly measured the lattice parameter (a) for all of the mixtures described in this paper and have used values for v_n (465 Å^3), A_n (33 Å^2) and V (612 Å^3) taken from the literature for monoolein[3] to calculate the water content of our highly swollen cubic samples as a first approximation. Results were obtained by expanding the coefficients of eq 1. and using a polynomial solver function in Matlab.

References

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2. R. H. Templer, J. M. Seddon, P. M. Duesing, R. Winter and J. Erbes, *The journal of physical chemistry. B*, 1998, **102**, 7262-7271.
3. G. C. Shearman, B. J. Khoo, M.-L. Motherwell, K. A. Brakke, O. Ces, C. Conn, J. M. Seddon and R. H. Templer, *Langmuir*, 2007, **23**, 7276-7285.