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Supplemental Information

Membrane Solubilization by Styrene-Maleic Acid Copolymers: Delineating the Role of Polymer Length

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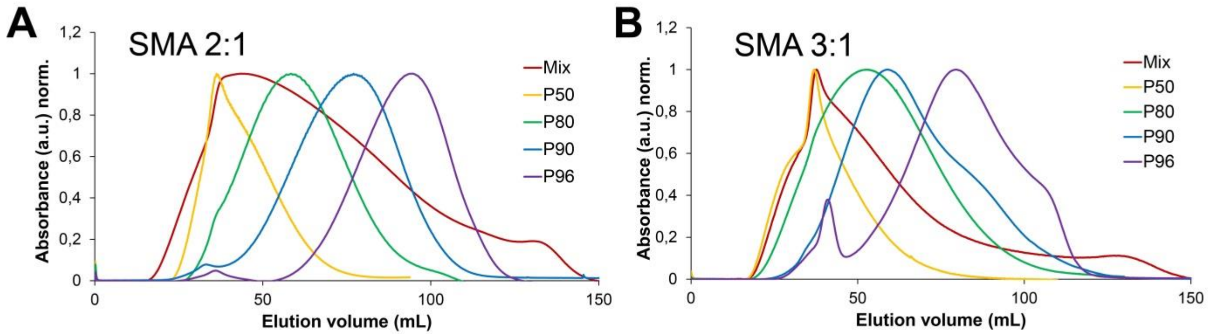

Figure S1. SEC chromatograms of 0.5 % (w/v) SMA copolymers (hydrolyzed form) in 2 mM Britton—Robinson buffer (pH=8.0). For both SMA 2:1 and SMA 3:1 polymers: Non-fractionated: red; P50: orange; P80: green; P90: blue; P96: purple.

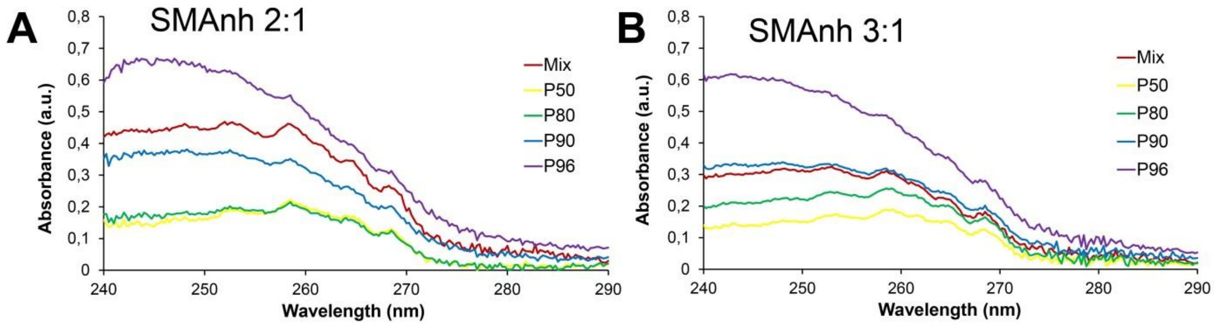

Figure S2. UV-Vis scans of SMAnh copolymers as 0.0125 % (w/v) in THF. Data points were obtained every 0.25 nm at a speed of 120 nm/min. For both SMAnh 2:1 and SMA 3:1nh polymers: Non-fractionated: red; P50: orange; P80: green; P90: blue; P96: purple.

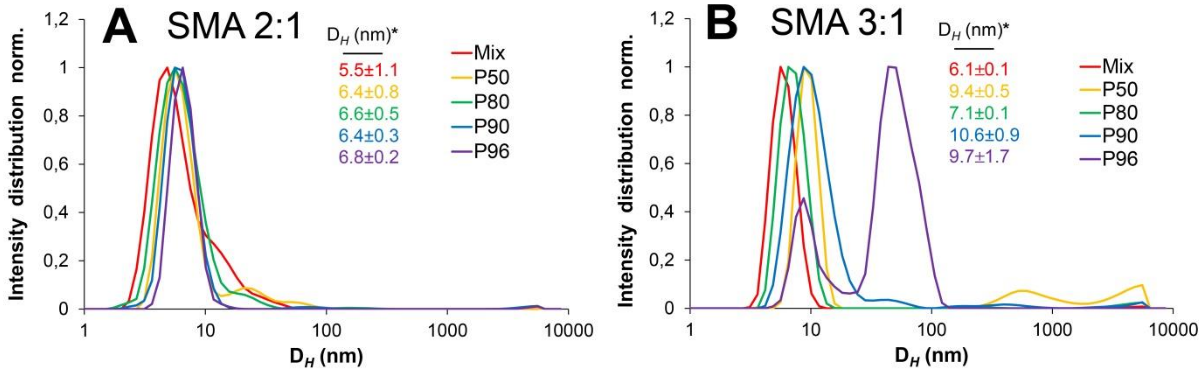

Figure S3. Intensity size distribution of soluble nanodiscs as quantified by dynamic light scattering of di-14:0 PC-nanodiscs bounded by (A) SMA 2:1-derived polymers and (B) SMA 3:1-derived polymers. For both SMA 2:1 and SMA 3:1 polymers: Non-fractionated: red; P50: orange; P80: green; P90: blue; P96: purple. Nanodiscs were obtained at a SMA-to-lipid mass ratio of 3.0. All experiments were performed at T=25 °C.

*Hydrodynamic diameters and errors reflect the positioning of the peak maximum within 6 x16 consecutive measurements. The actual size distribution is several nm.

**Hydrodynamic diameter corresponding to the first peak at D_H~9 nm.

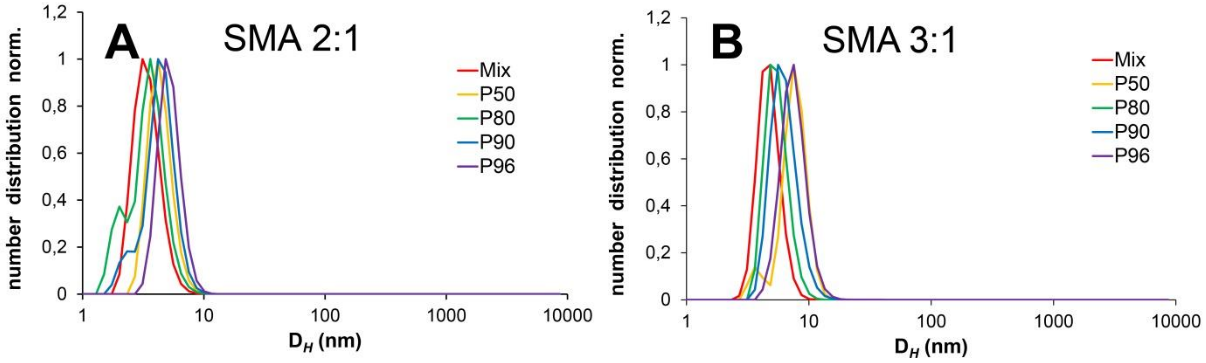

Figure S4. Figure.4. Number size distribution of soluble nanodiscs as quantified by dynamic light scattering of di-14:0 PC-nanodiscs bounded by (A) SMA 2:1-derived polymers and (B) SMA 3:1-derived polymers. For both SMA 2:1 and SMA 3:1 polymers: Non-fractionated: red; P50: orange; P80: green; P90: blue; P96: purple. Nanodiscs were obtained at a SMA-to-lipid mass ratio of 3.0. All experiments were performed at T=25 °C.

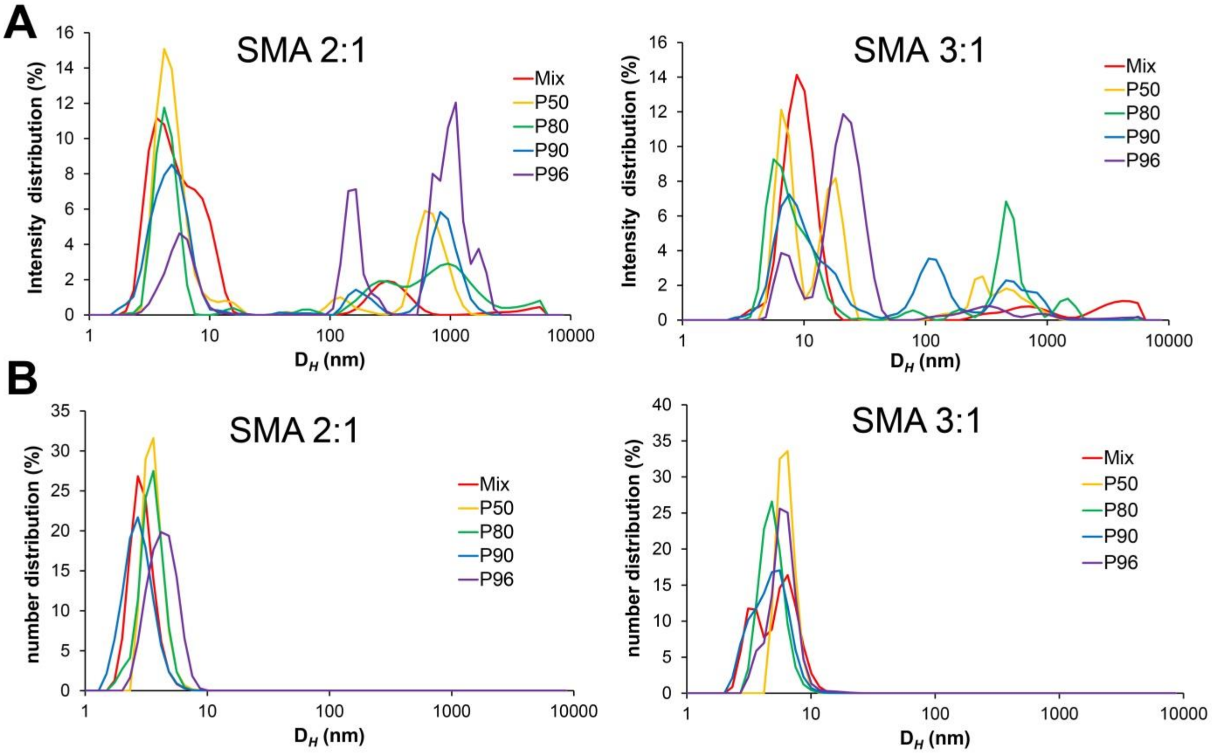

Figure S5. Size distribution of 1 % (w/v) SMA polymers in buffer (Tris 50 mM NaCl 150 mM pH=8.0) expressed as (A) intensity size distribution and (B) number size distribution. For both SMA 2:1 and SMA 3:1 polymers: Non-fractionated: red; P50: orange; P80: green; P90: blue; P96: purple. Nanodiscs were obtained at a SMA-to-lipid mass ratio of 3.0. All experiments were performed at T=25 °C.

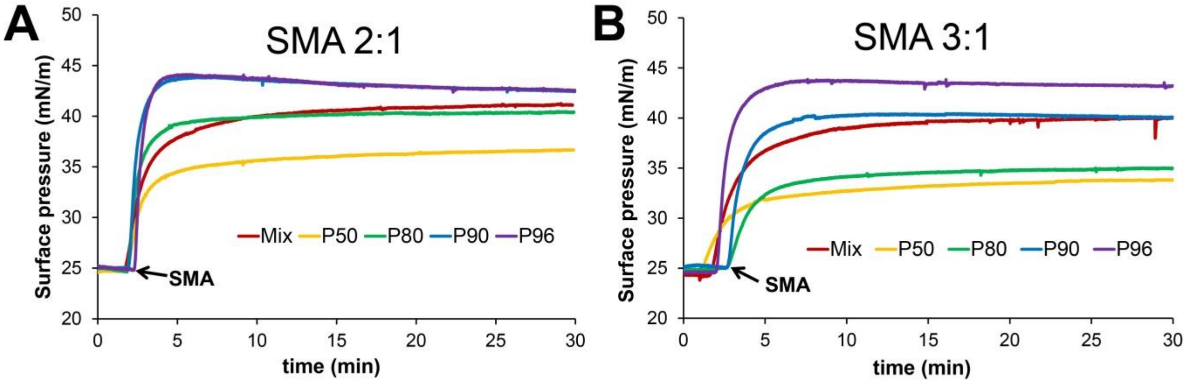

Figure S6. Surface pressure increase in monolayers composed of di-14:0 PC induced by the insertion of SMA copolymer fractions obtained from commercial mixtures consisting of SMA 2:1 (A) or SMA 3:1 (B).

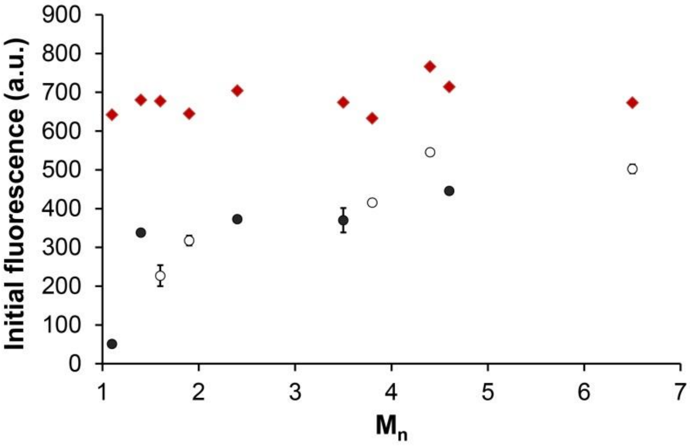

Figure S7. Initial rhodamine fluorescence in nanodiscs bounded to different M_n SMA mixtures and SMA fractions. Nanodiscs consist of di-14:0 PC with 20 % (mol) N-rhodamine di 14:0 PE s. Nanodiscs encircled by SMA 2:1-derived polymers are indicated by full circles while those by SMA 3:1-derived polymers are indicated by empty circles. Fluorescence was measured after 5 minute stabilization at 30 °C at λ_{em}=585 nm. Diamonds indicate the fluorescence intensity values obtained after the addition of empty nanodiscs to a solution of labeled nanodiscs in a 20:1 molar ratio (values corresponding to Figure 6A and 6B). Nanodiscs were obtained at a SMA-to-lipid mass ratio of ~3.

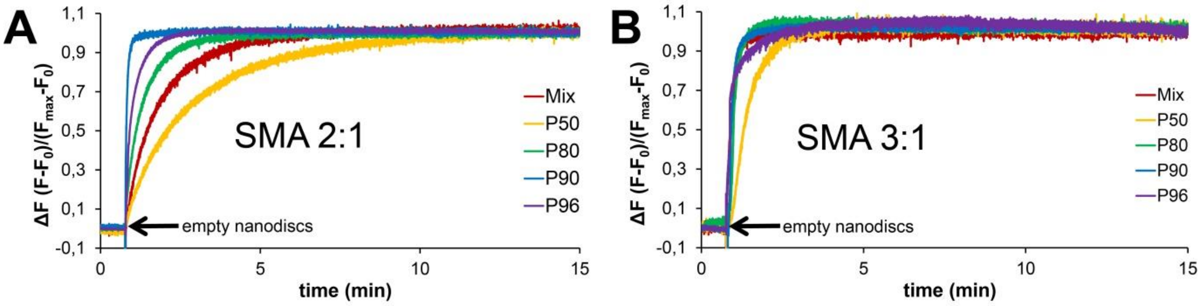

Figure S8. Dequenching of rhodamine-PE incorporated in di-14:0 PC nanodiscs (20% mol rhodamine) with time upon addition of unlabeled nanodiscs. Nanodiscs are bounded by SMA polymers obtained from commercial SMA 2:1 mixtures (A) or from SMA 3:1 mixtures (B). Nanodiscs were obtained at a SMA-to-lipid mass ratio of ~3 and mixed in a ratio (mol) of 5:1 empty nanodiscs/ fluoropohore-loaded. Fluorescence dequenching was recorded for 15 min at λ_{em}=585 nm at 30 °C.

Table S1. T_m values of di-16:0 PC in nanodisc self-assemblies measured by DSC. Data are given as averages of the 2nd and 3rd heating cycle from 2 independent samples, with errors representing the standard deviation.

T_m (°C)	MLVs	Mix	P50	P80	P90	P96
SMA 2:1	40.8±0.1	33.4±0.1	32.3±0.2	30.7±0.1	17.7±0.3	33.9±0.8
SMA 3:1	40.8±0.1	25.4±0.1	25.5±0.4	24.5±0.1	19.0±0.1	19.2±0.2