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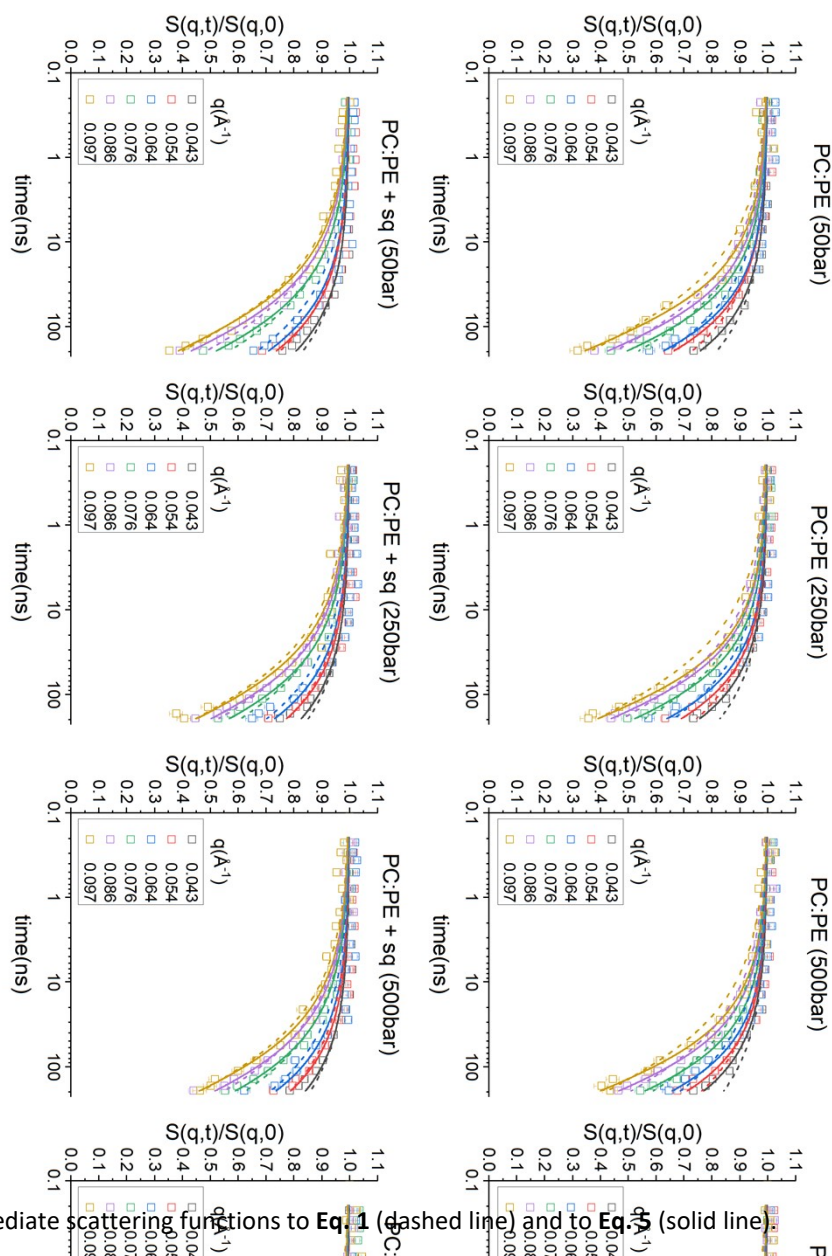


Figure S1: Fits of the intermediate scattering functions to Eq. 1 (dashed line) and to Eq. 5 (solid line).

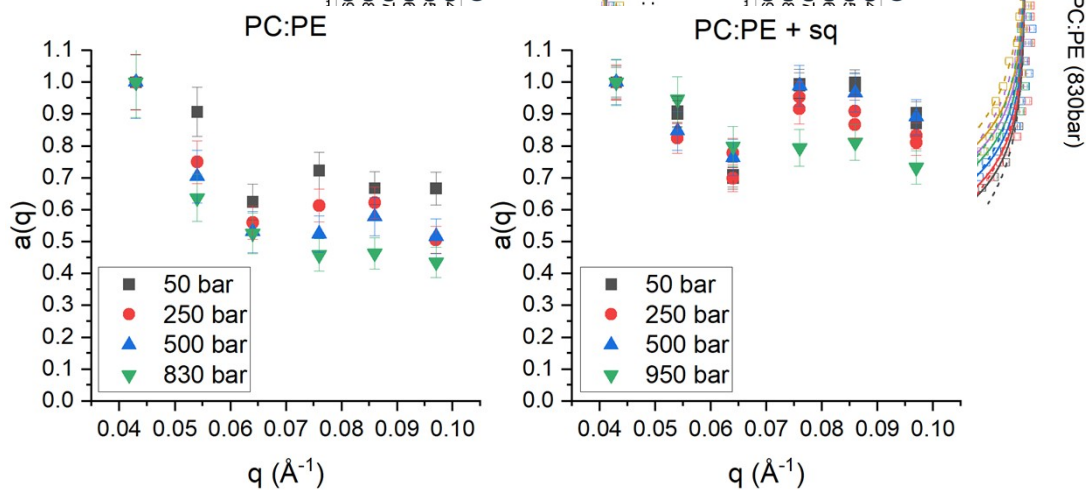
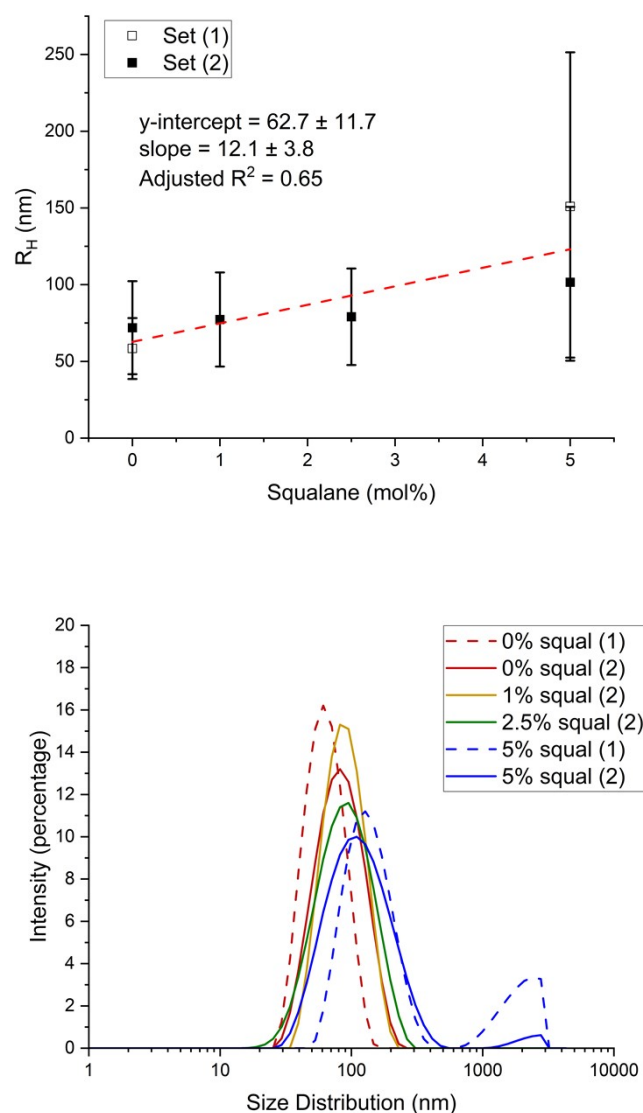


Figure S2: Amplitude  $a(q)$  obtained from fitting data to Eq. 5 with  $\Gamma_{ZG}$  as a shared parameter.



**Figure S3:** Determination of vesicle  $R_H$  using DLS. (Top)  $R_H$  of DoPhPC:DoPhPE (9:1) vesicles as a function of mol% squalane. Data from two sets of samples are shown in open squares (set 1) and closed squares (set 2).

The two sets differ mostly in the time frame the DLS measures were taken. Set1 was measured after HP treatment. Set 2 was measured directly following extrusion. Each sample was measured three times and the average value reported. Error bars indicate the standard deviation in vesicle size, not the standard deviation of the triplicate measurements. Dashed line indicates a linear fit of the values from both data sets. (Bottom) Size distribution of vesicle  $R_H$  for samples from two sets of measurements. The dashed lines indicate the data from set 1 and the solid lines indicate the data from set 2. Measurements were made of DoPhPC:DoPhPE (9:1) containing 0 mol% (red), 1 mol% (yellow), 2.5 mol% (green) and 5 mol% (blue) squalane.

Table S1: Average  $\pm$  stdev of values measured by DLS in technical triplicate. Measurements were made with two different sets of samples. Set 1 was measured at 25°C and Set 2 was measured at 20°C. DLS was used to calculate  $R_H$ , Polydispersity Index (PDI), and standard deviation of the  $R_H$  values.

| Sample         | $R_H$ (nm)        | PDI               | Stdev (nm)        |
|----------------|-------------------|-------------------|-------------------|
| 0%sq 25C (1)   | 58.38 $\pm$ 0.51  | 0.116 $\pm$ 0.013 | 19.84 $\pm$ 1.22  |
| 5%sq 25C (1)   | 150.95 $\pm$ 3.35 | 0.445 $\pm$ 0.048 | 100.49 $\pm$ 3.42 |
|                |                   |                   |                   |
| 0%sq 20C (2)   | 71.96 $\pm$ 0.85  | 0.178 $\pm$ 0.013 | 30.34 $\pm$ 0.72  |
| 1%sq 20C (2)   | 77.29 $\pm$ 0.86  | 0.157 $\pm$ 0.013 | 30.64 $\pm$ 1.04  |
| 2.5%sq 20C (2) | 79.09 $\pm$ 0.39  | 0.159 $\pm$ 0.020 | 31.46 $\pm$ 1.91  |
| 5%sq 20C (2)   | 101.6 $\pm$ 0.53  | 0.234 $\pm$ 0.014 | 49.10 $\pm$ 1.69  |