Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information For:

TRANSVERSE LIPID ORGANIZATION DICTATES BENDING FLUCTUATIONS IN MODEL PLASMA MEMBRANES

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Table S1: aLUV leaflet compositions prepared from POPE acceptor and ESM donor, determined from ^{31}P-NMR and ^{1}H-NMR. The overall mole fraction (χ), the mole fraction of the outer (χ^{out}) and inner (χ^{in}) leaflets and the fraction of totatl ESM in the outer leaflet (f^{out}).

Component	χ	f^{out}	χ^{out}	χ^{in}
ESM	0.25	0.89	0.44	0.06
POPE	0.75	--	0.56	0.94
Total	1		1	1

Table S2 Structural refinement of asymmetric ESM/POPE vesicles. Data were modeled with an symmetric five slab scattering length density profile. Parameter uncertainties are estimated to be < 5%. Modelled parameters indicate: area per lipid (A_L; Å^2), bilayer thickness (D_B; Å) and the hydrocarbon thickness (2DC; Å).

	aLUV[a]		
	15°C	30°C	45°C
A_L	45.7	54.2	59.4
D_B	48.6	42.5	39.6
2DC	37.6	33.2	31.1

[a]Due to lack of leaflet contrast in the aLUV, data were treated with a symmetric bilayer model, thus parameters are reported rather than a per leaflet basis.

Table S3 Structural refinement of symmetric vesicles. Data were modeled with an symmetric five slab scattering length density profile. Parameter uncertainties are estimated to be < 5%.

	POPE			ESM/POPE (1:3)[a]			ESM/POPE (4.4:5.6)			ESM/POPE (8:1)			ESM		
Temp (°C)	15	30	45	15	30	45	15	30	45	15	30	45	15	30	45
A_L	44.7	56.7	60.9	-	54.1	59	43.2	52.9	57.7	-	50.5	55.9	43.8	49.7	55.5
D_B	50.5	41.4	38.9	-	42.5	39.9	51	42.9	40.6	-	43.8	41.4	49.2	44.1	41.6
2DC	39.5	32.6	30.8	-	33.2	31.3	39.1	33.2	31.6	-	33.2	31.8	36.6	33	31.7

[a]SAXS only.

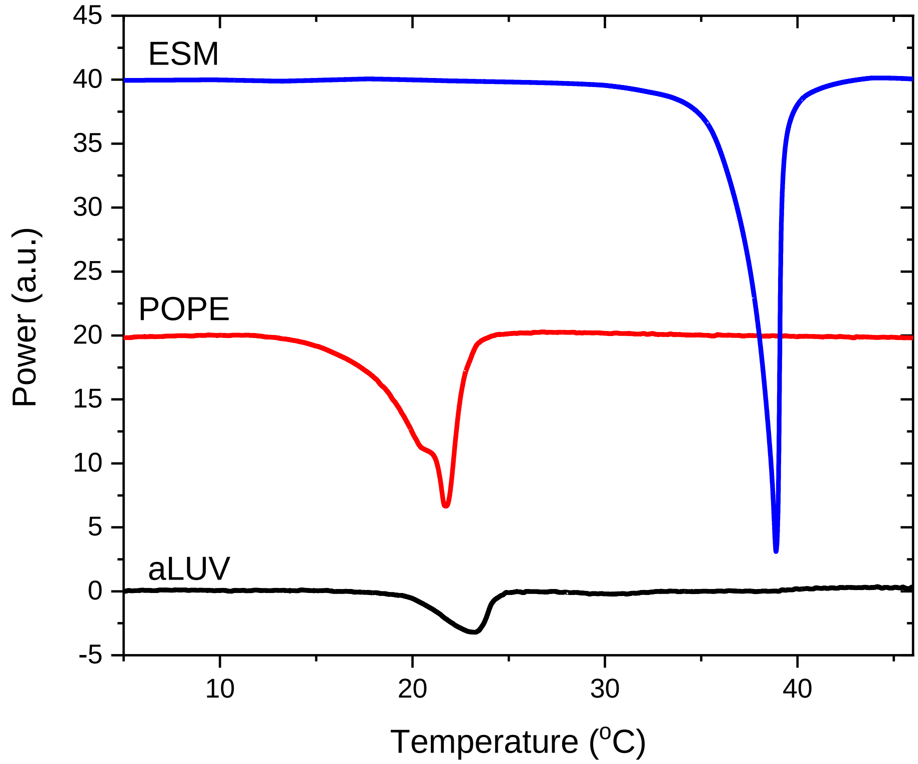

Figure S1: DSC thermograms of the aLUV (black) and its individual components ESM (blue) and POPE (red). These data are consistent with the notion that the aLUV is fluid at 30°C.

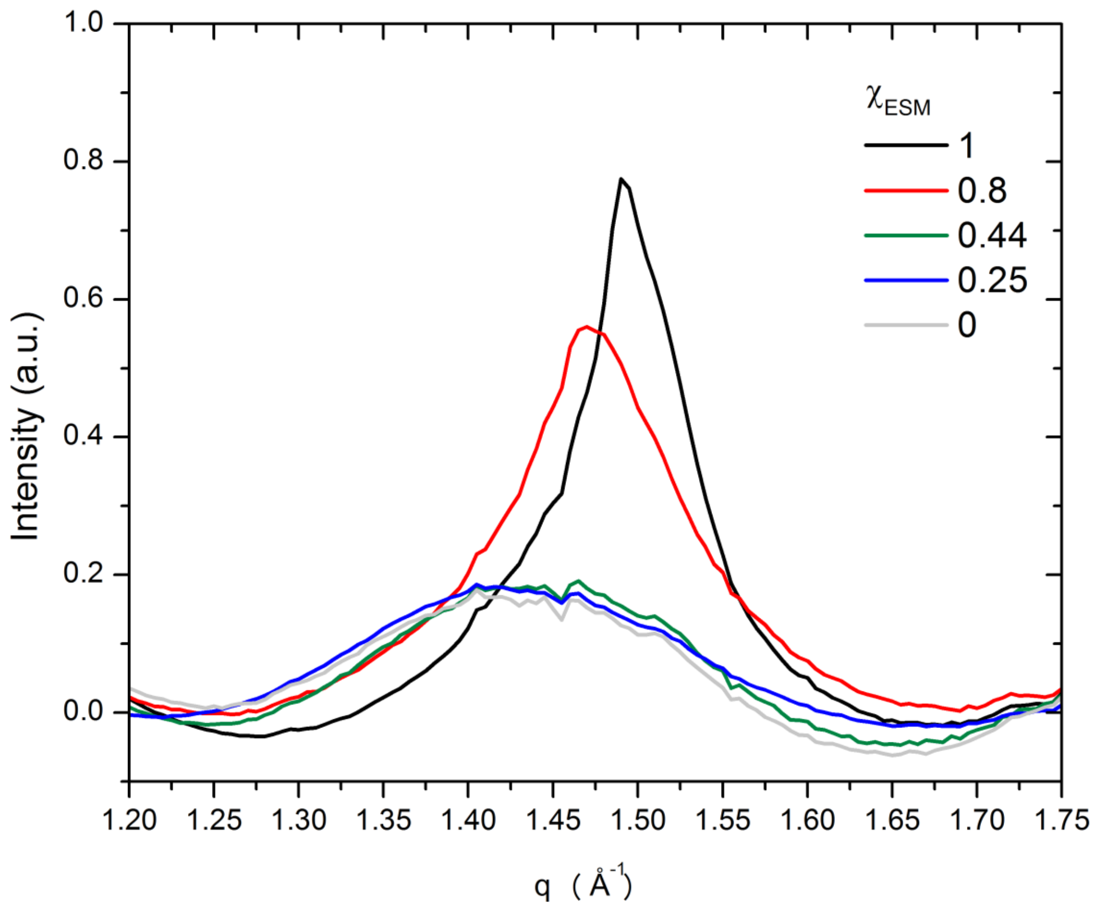

Figure S2: Wide angle X-ray scattering data multi-lamellar vesicles (MLV) composed of different mole fractions of ESM (χ_{ESM}) at 30^{o}C. These data suggest that compositions up to χ_{ESM}=0.8 are fluid at 30^{o}C as seen by the lack of a sharp WAXS peak for χ_{ESM}=0, 0.25 and 0.44.

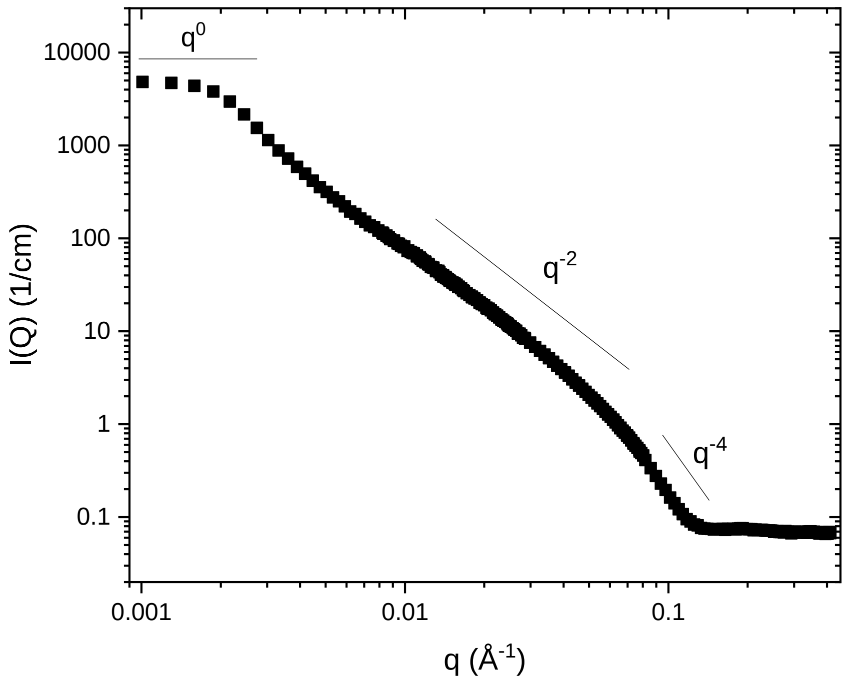

Figure S3: The SANS data for the aLUV. The data displays a q^0 dependence at low-q, a q^{-2} dependence at medium-*q*, arising from the lamellar bilayer of the aLUV which transitions to a q^{-4} dependence indicative of objects with smooth surfaces and sharp interfaces. All of which are characteristics of structurally sound vesicles. aLUV solution was diluted by a factor of 10 from the sample used for structural analysis.

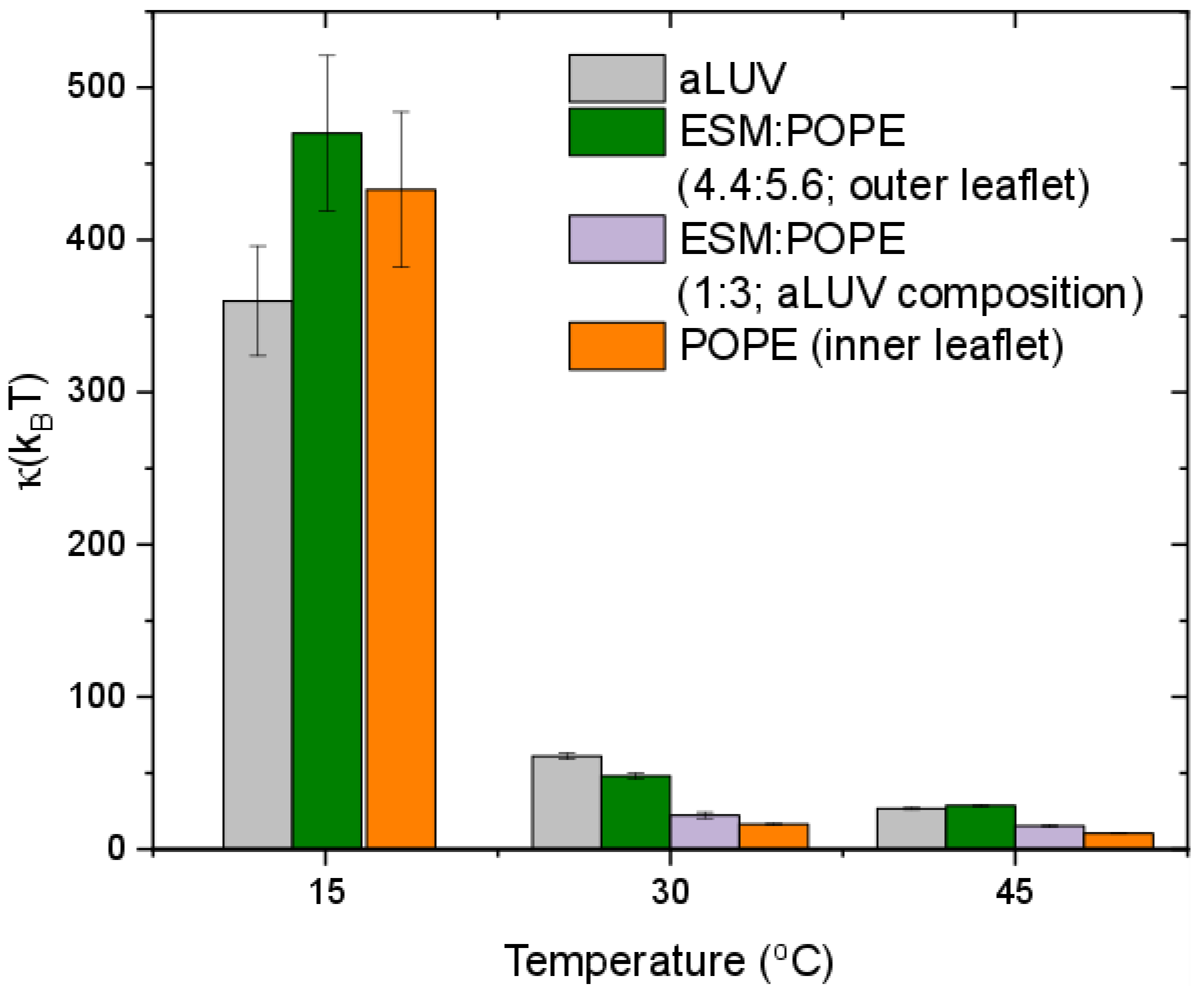

Figure S4: Bending moduli (κ) for the aLUVs and symmetric vesicles with compositions corresponding to the inner leaflet, outer leaflet and overall aLUV composition measured with NSE at 15 °C, 30 °C and 45 °C.

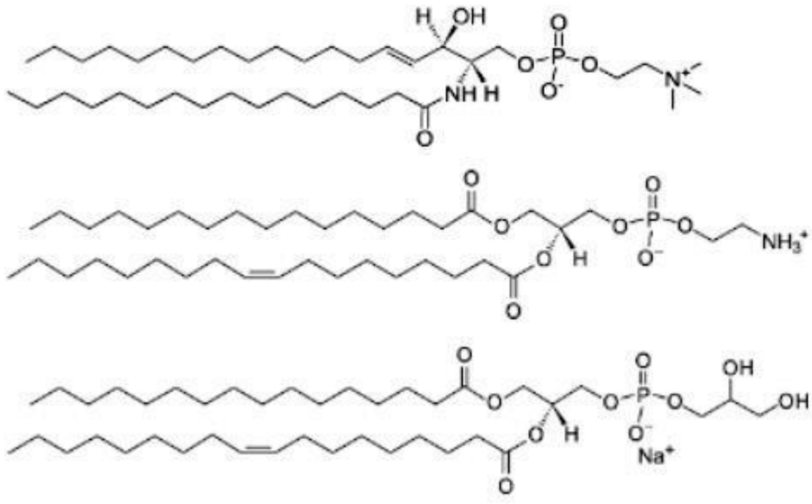

Figure S5: A) Most abundant sphingomyelin structure in ESM. B) Structure of POPE. C) Structure of POPG.

S2: Intermediate Scattering curves.

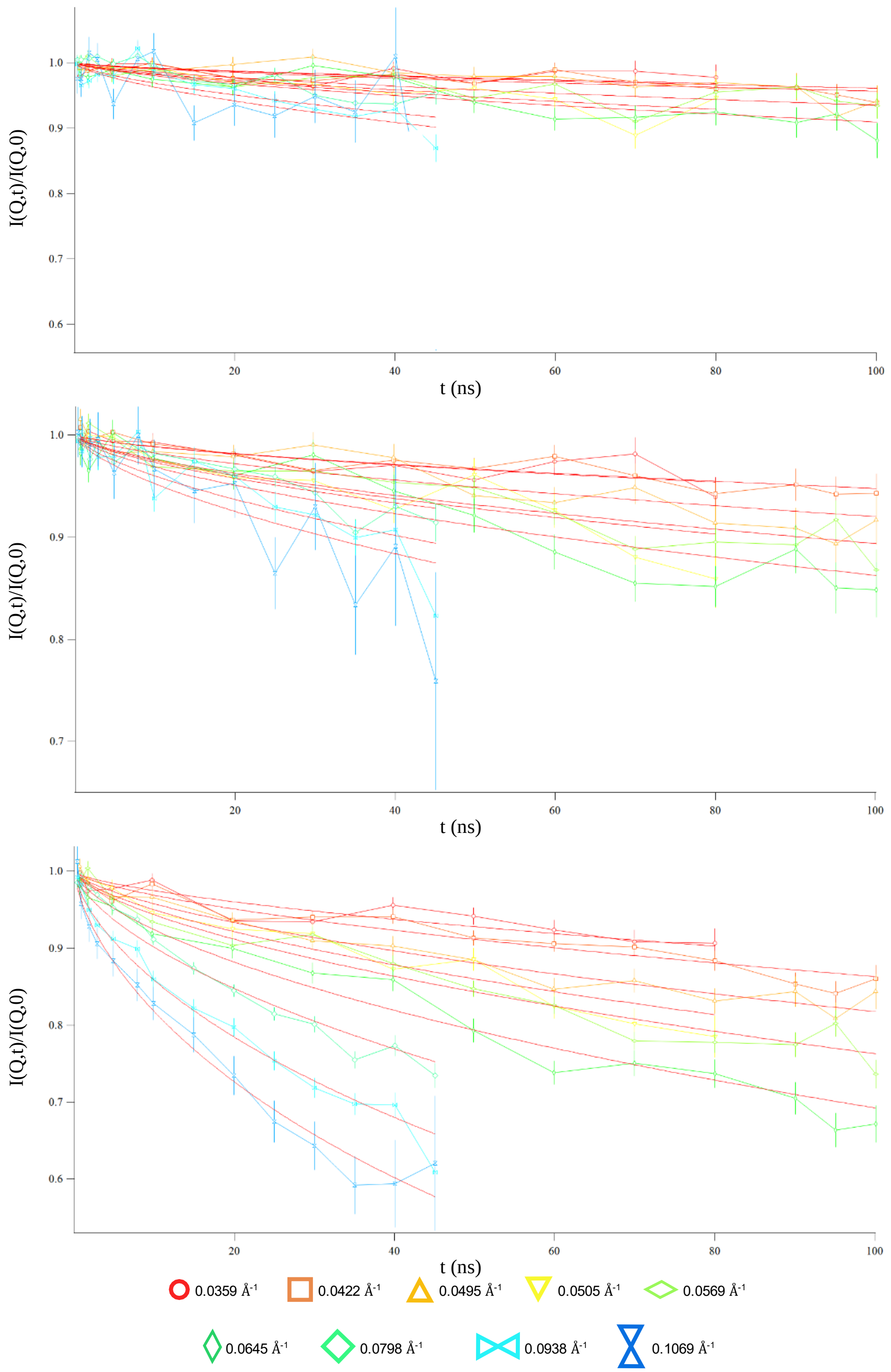

Figure S2.1: Intermediate scattering function measured by NSE for the ESM control at T = 288 K (top), 303 K (middle), and 318 K (bottom). The legend below displays the various colors/patterns in the decay plot that correspond to the different wavenumber transfer values. Error bars represent one standard deviation.

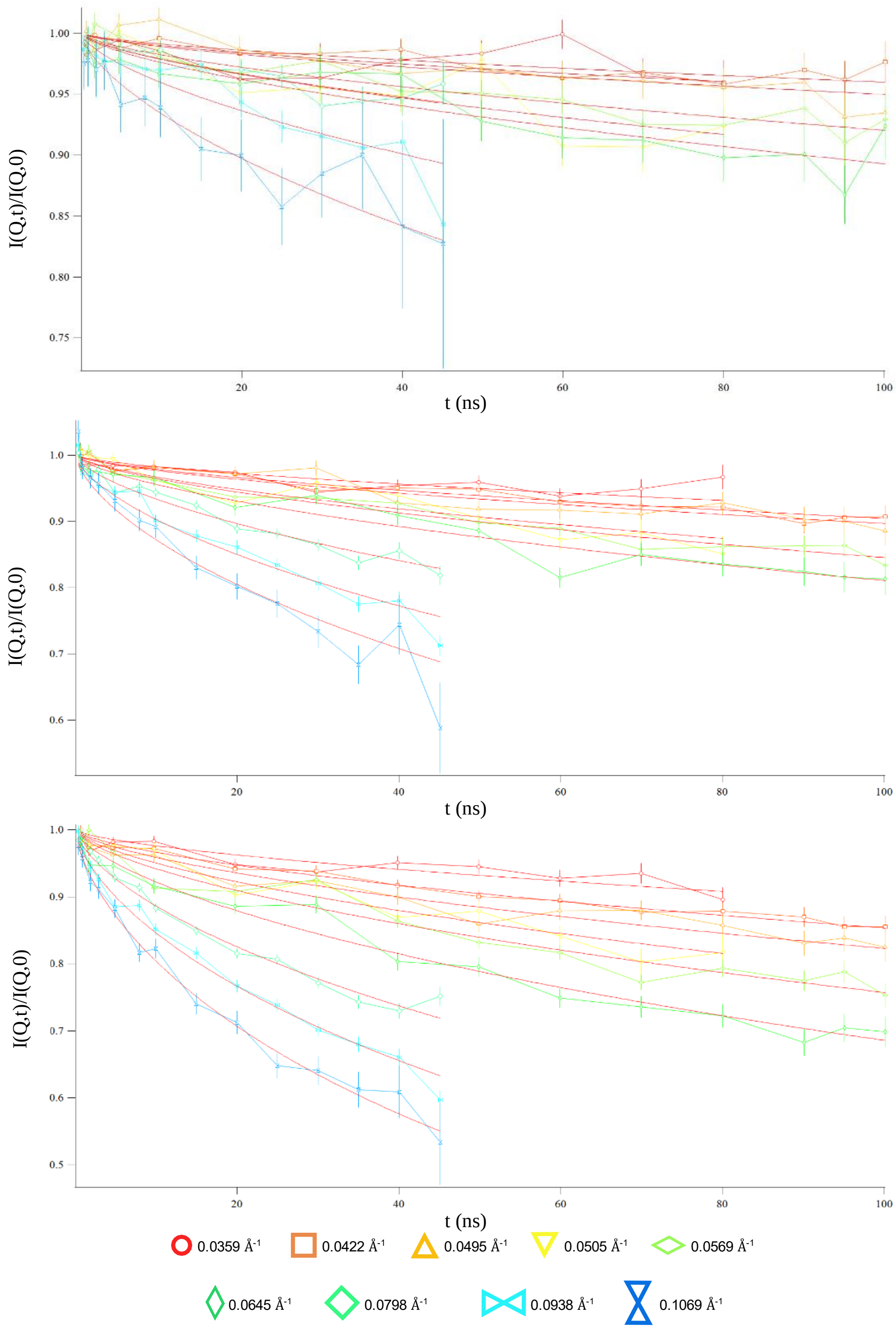

Figure S2.2: Intermediate scattering function measured by NSE for the asymmetric LUV at T = 288 K (top), 303 K (middle), and 318 K (bottom). The legend below displays the various colors/patterns in the decay plot that correspond to the different wavenumber transfer values. Error bars represent one standard deviation.

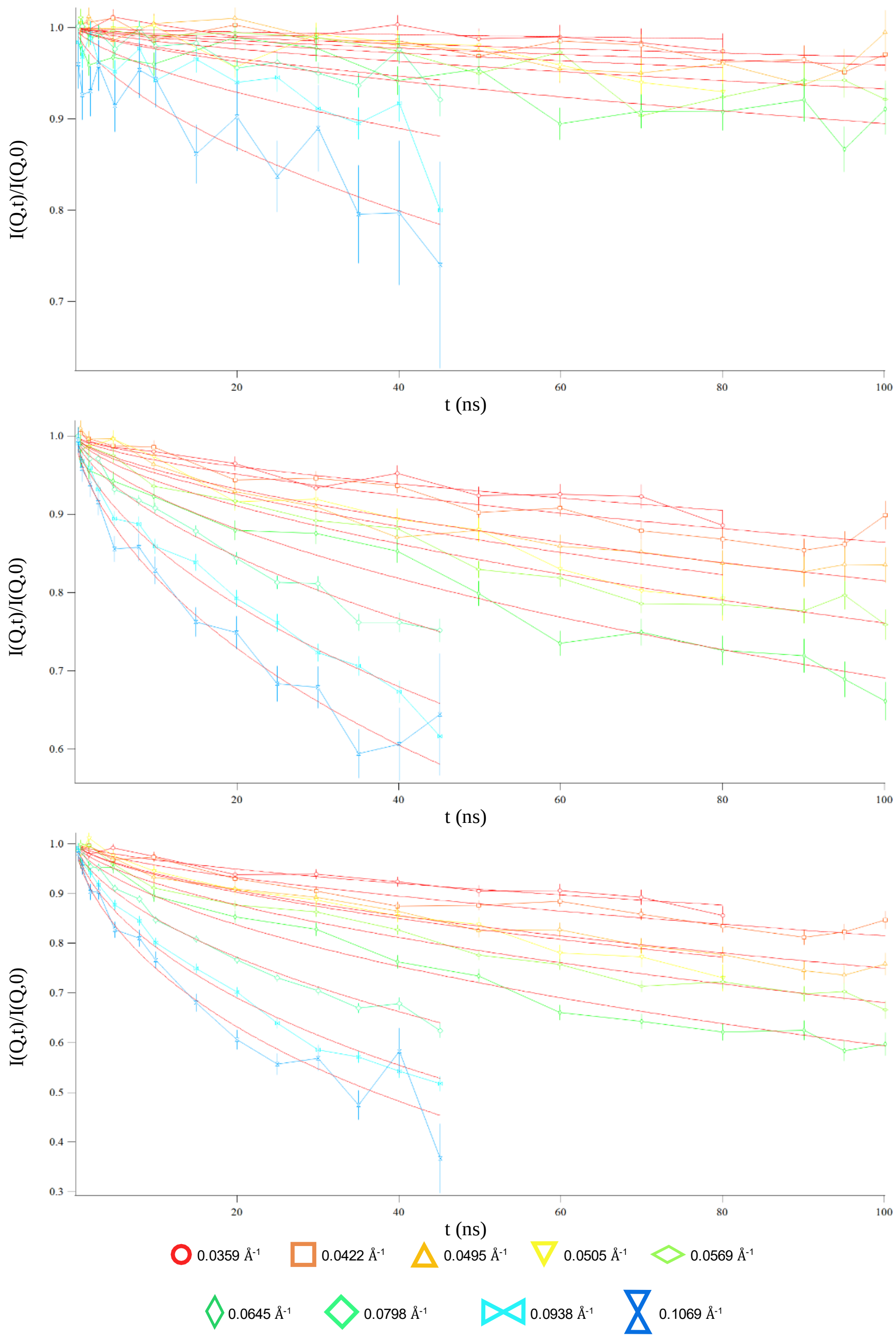

Figure S2.3: Intermediate scattering function measured by NSE for the POPE control (with NaCl) at T = 288 K (top), 303 K (middle), and 318 K (bottom). The legend below displays the various colors/patterns in the decay plot that correspond to the different wavenumber transfer values. Error bars represent one standard deviation.

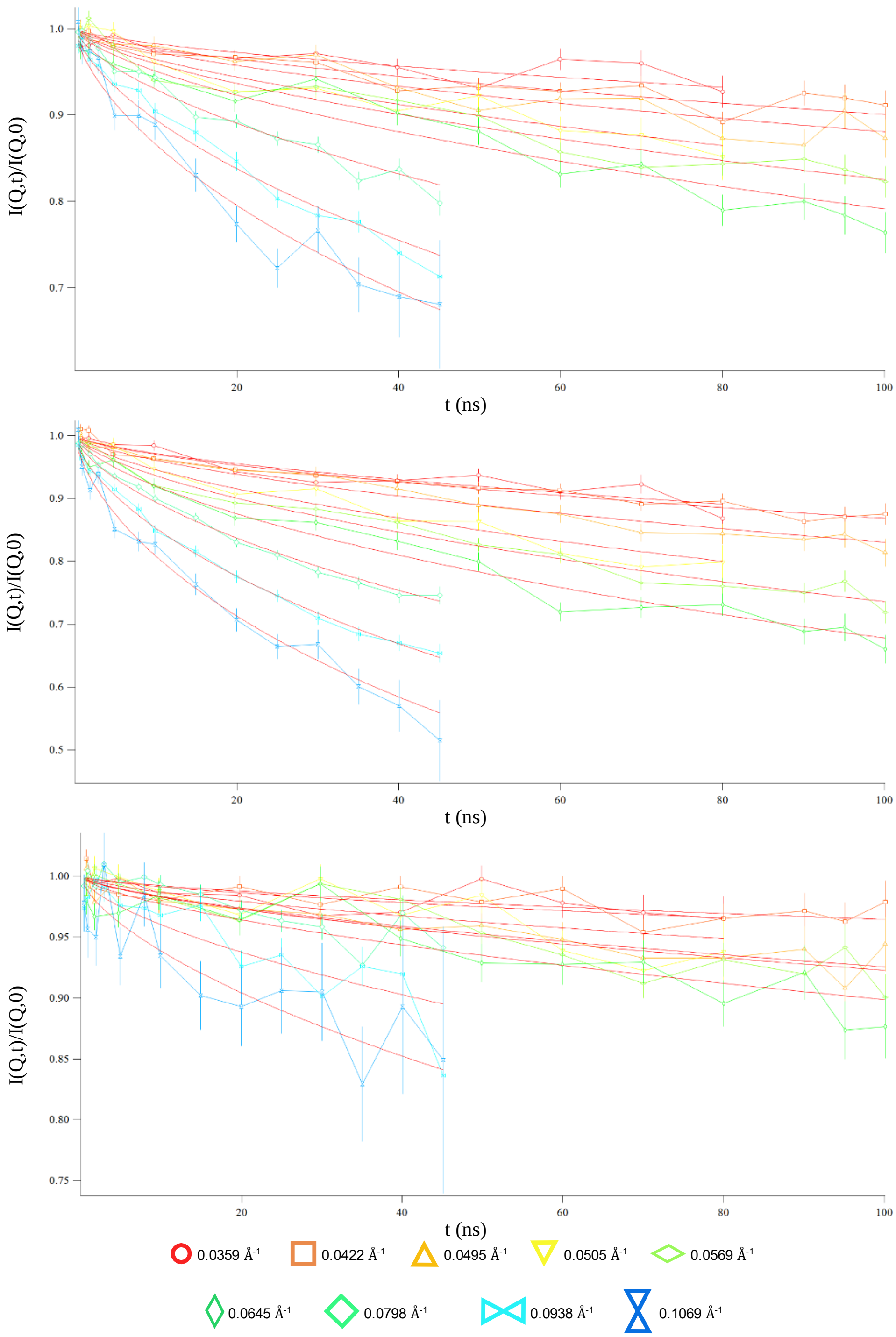

Figure S2.4: Intermediate scattering function measured by NSE for the POPE/ESM (1:1) control at T = 288 K (top), 303 K (middle), and 318 K (bottom). The legend below displays the various colors/patterns in the decay plot that correspond to the different wavenumber transfer values. Error bars represent one standard deviation.

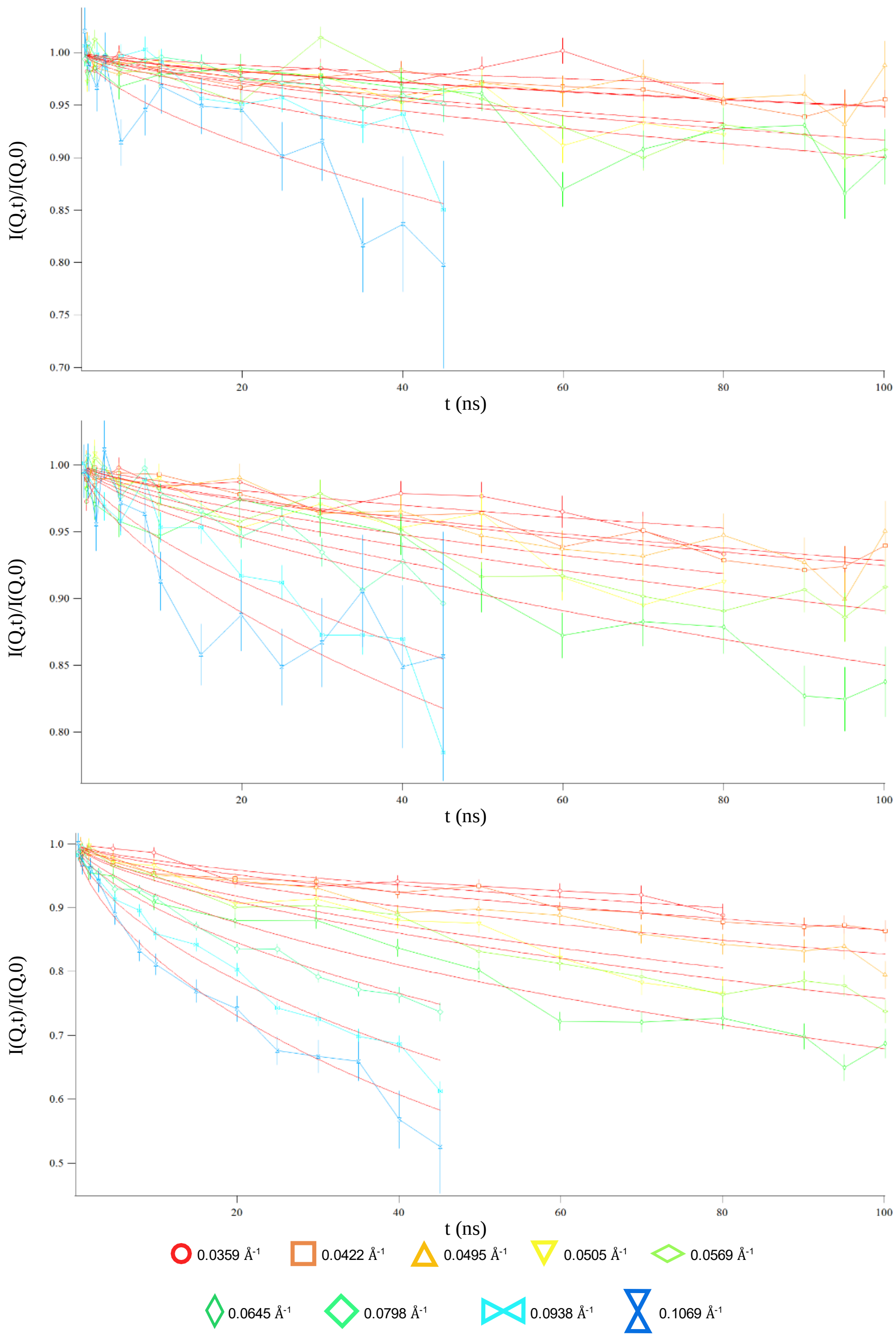

Figure S2.5: Intermediate scattering function measured by NSE for the POPE/ESM (1:4) control at T = 288 K (top), 303 K (middle), and 318 K (bottom). The legend below displays the various colors/patterns in the decay plot that correspond to the different wavenumber transfer values. Error bars represent one standard deviation.

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