Electronic Supplementary Information

Spontaneous vesicle formation and vesicle-to-α-gel transition in aqueous mixtures of sodium monododecylphosphate and guanidinium salts

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Fig. S1 Photographs of SDP (0.15 wt% or ~5 mM)/H_2O mixtures (a) in the absence of GuSalts and (b–f) in the presence of 0.30 wt% (b) GuCl, (c) $GuSO_4$, (d) $GuSO_3$, (e) $GuPO_4$, amd (f) $GuCO_3$. All samples were placed at 25.0 °C for at least 48 h before the observation.

To clearly see the sediment, choose black as the background of photos.

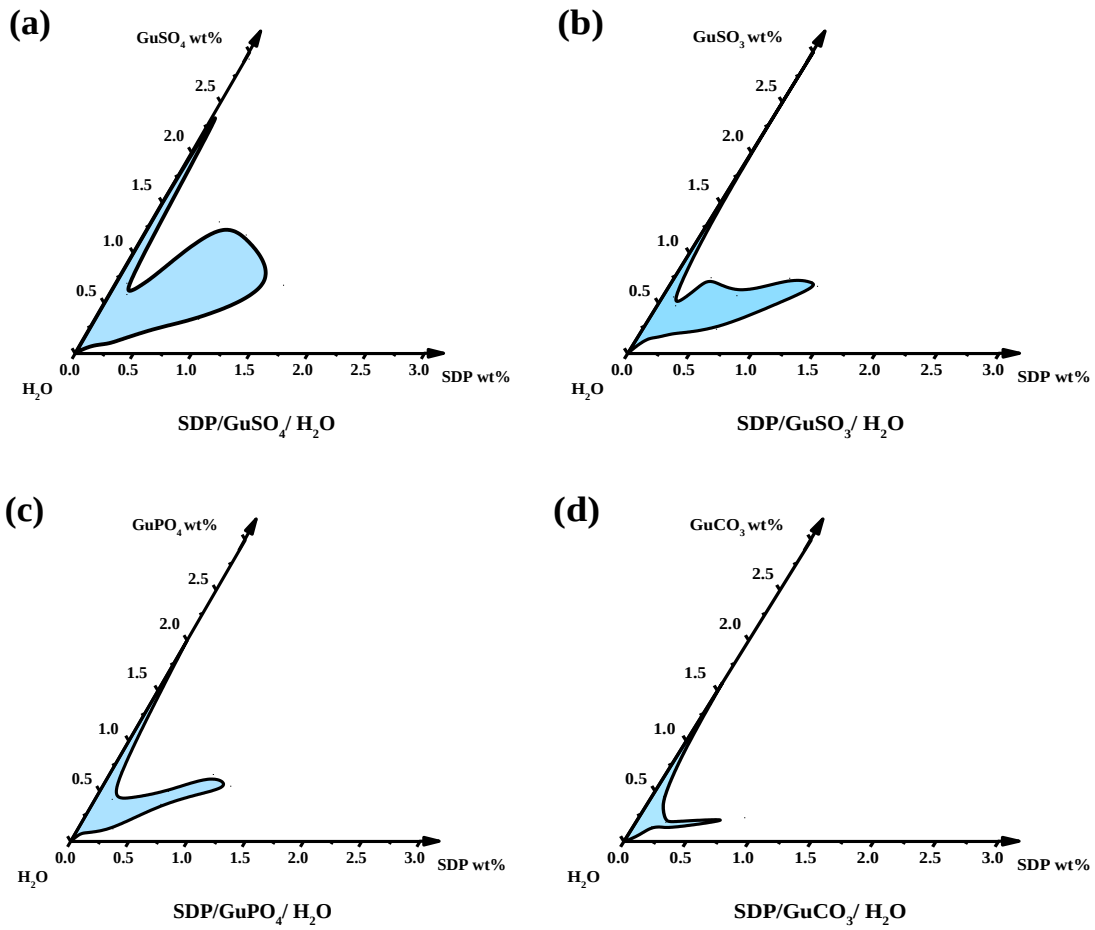

Fig. S2 Isotropic phase diagrams of SDP/GuSalt/H_2O ternary systems at 25.0 °C.

Table S1 The pK_a values of acid at 25.0 °C.

Acid	Chemical formula	pK_{a1} [S1]
Hydrochloric acid	HCl	–6.30
Sulfuric acid	H_2SO_4	–3.00
Sulfamic acid	NH_2SO_3H	0.99
Phosphoric acid	H_3PO_4	2.15
Carbonic acid	H_2CO_3	6.35

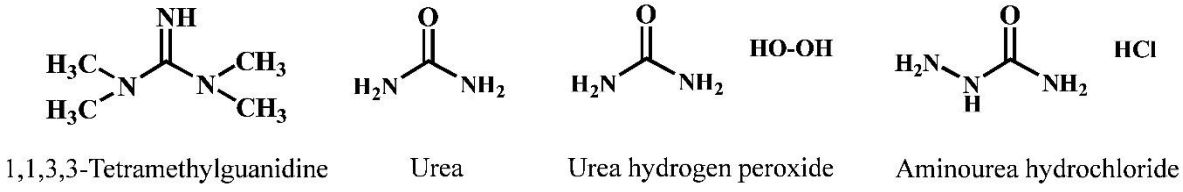

Fig. S3 Photographs of SDP (0.15 wt% or ~5 mM)/H_2O mixtures in the presence of (a) 1,1,3,3-tetramethylguanidine, (b) urea, (c) urea hydrogen peroxide, and (d) aminourea hydrochloride. All samples were placed at 25.0 °C for at least 48 h before the observation.

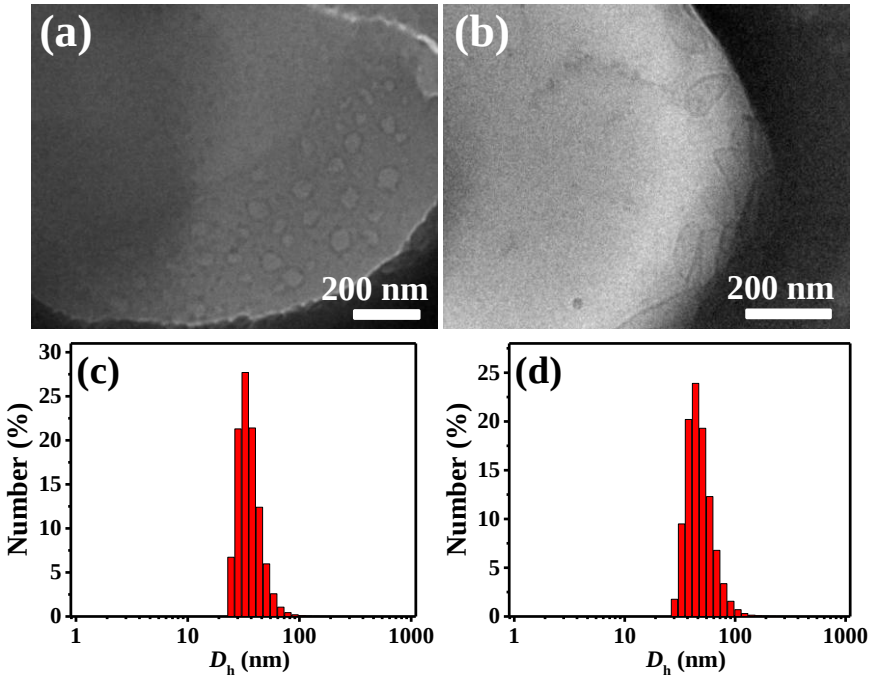

Fig. S4 (a, b) Cryo-TEM images and (c, d) size distributions of SDP/GuCl/H_2O systems with different compositions at 25.0 °C. (a, c) 0.90 wt% (or ~30 mM) SDP, 0.55 wt% (or ~57 mM) GuCl; (b, d) 1.50 wt% (or ~50 mM) SDP, 0.55 wt% (or ~57 mM) GuCl.

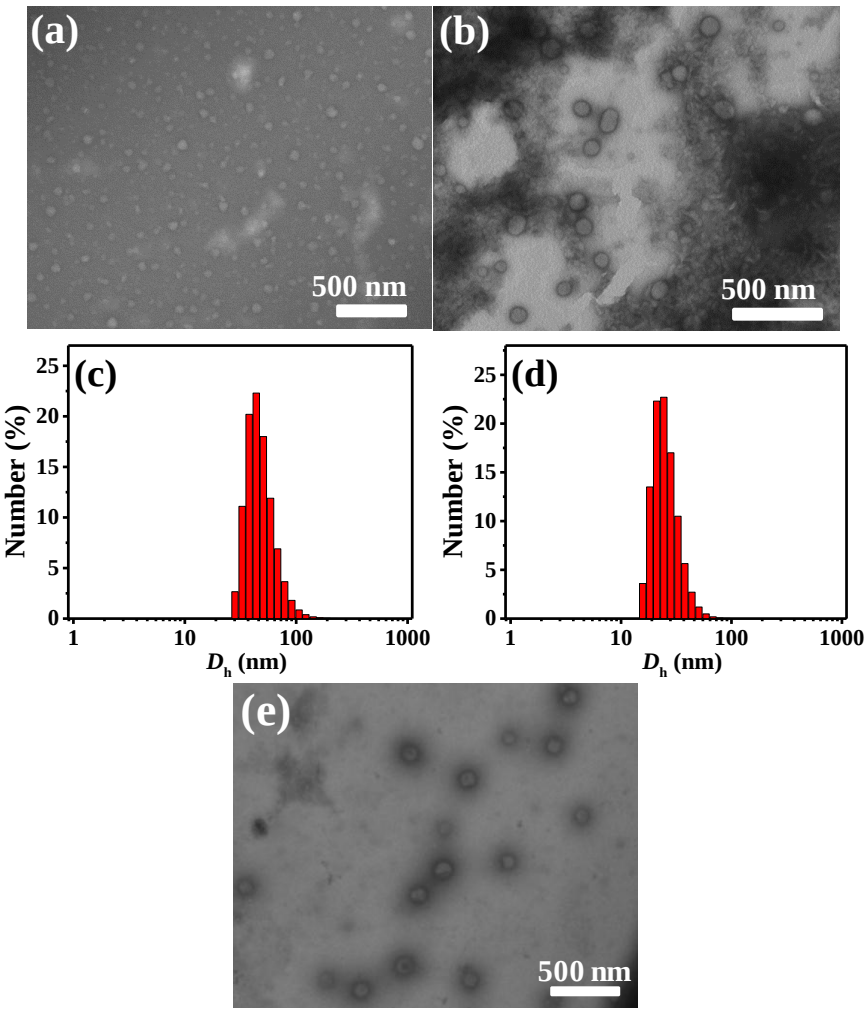

Fig. S5 (a, b, e) NS-TEM images and (c, d) size distributions of SDP/$GuSO_4$/H_2O systems with different compositions at 25.0 °C. (a, c) 0.15 wt% (or ~5 mM) SDP, 0.30 wt% (or ~28 mM) $GuSO_4$; (b, d) 0.60 wt% (or ~20 mM) SDP, 0.55 wt% (or ~51 mM) $GuSO_4$; (e) 0.15 wt% (or ~5 mM) SDP, 0.34 wt% (or ~31 mM) $GuSO_4$.

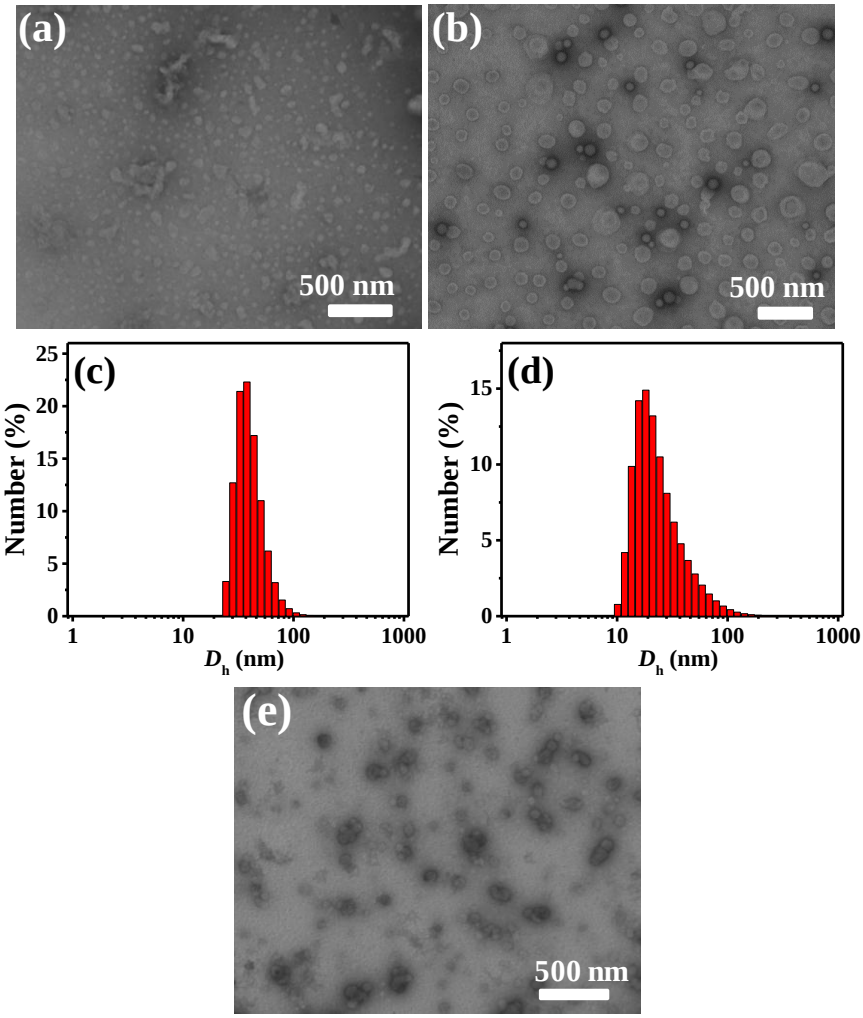

Fig. S6 (a, b, e) NS-TEM images and (c, d) size distributions of SDP/$GuSO_3$/H_2O systems with different compositions at 25.0 °C. (a, c) 0.15 wt% (or ~5 mM) SDP, 0.30 wt% (or ~19 mM) $GuSO_3$; (b, d) 0.60 wt% (or ~20 mM) SDP, 0.55 wt% (or ~35 mM) $GuSO_3$; (e) 0.15 wt% (or ~5 mM) SDP, 0.49 wt% (or ~31 mM) $GuSO_3$.

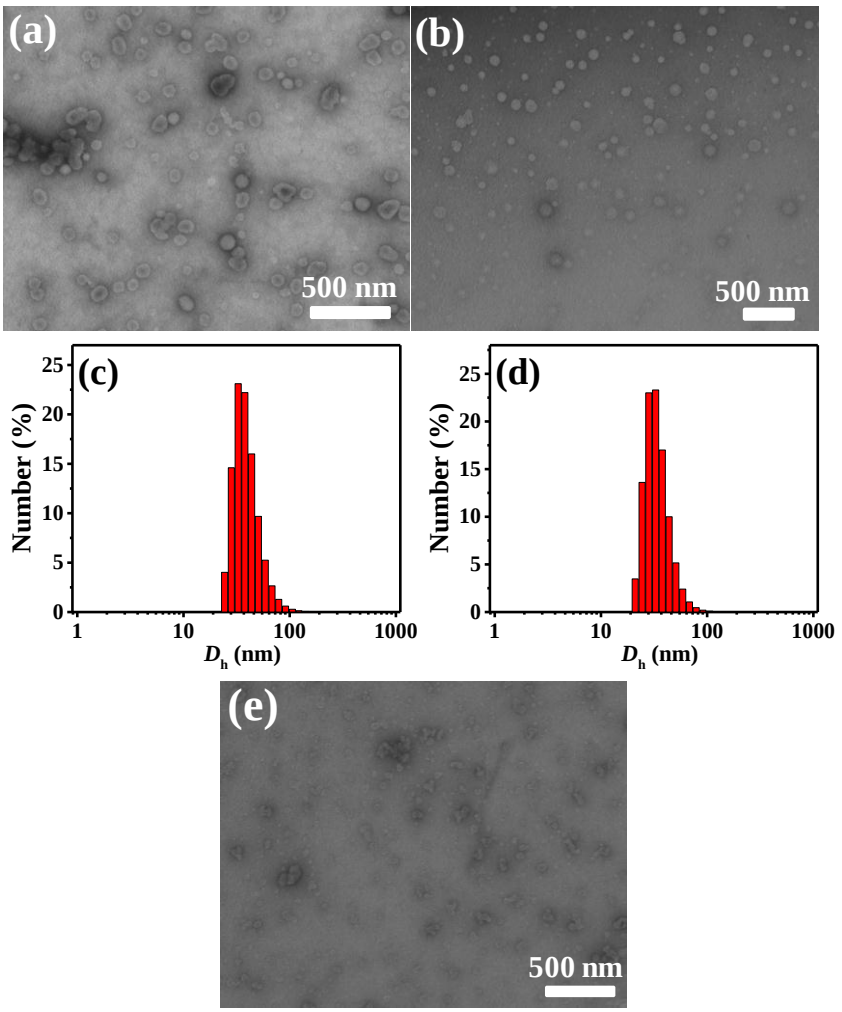

Fig. S7 (a, b, e) NS-TEM images and (c, d) size distributions of SDP/$GuPO_4$/H_2O systems with different compositions at 25.0 °C. (a, c) 0.15 wt% (or ~5 mM) SDP, 0.30 wt% (or ~28 mM) $GuPO_4$; (b, d) 0.60 wt% (or ~20 mM) SDP, 0.55 wt% (or ~51 mM) $GuPO_4$; (e) 0.15 wt% (or ~5 mM) SDP, 0.34 wt% (or ~31 mM) $GuPO_4$.

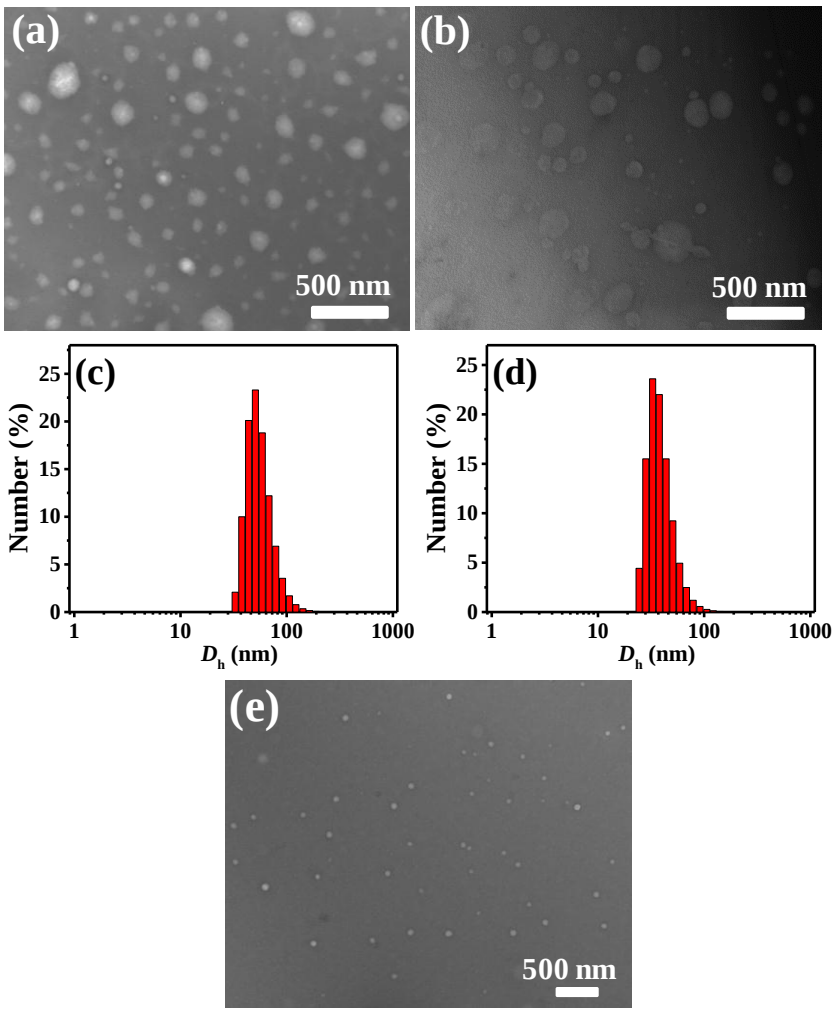

Fig. S8 (a, b, e) NS-TEM images and (c, d) size distributions of SDP/$GuCO_3$/H_2O systems with different compositions at 25.0 °C. (a, c) 0.15 wt% (or ~5 mM) SDP, 0.30 wt% (or ~34 mM) $GuCO_3$; (b, d) 0.60 wt% (or ~20 mM) SDP, 0.21 wt% (or ~23 mM) $GuCO_3$; (e) 0.15 wt% (or ~5 mM) SDP, 0.27 wt% (or ~31 mM) $GuCO_3$.

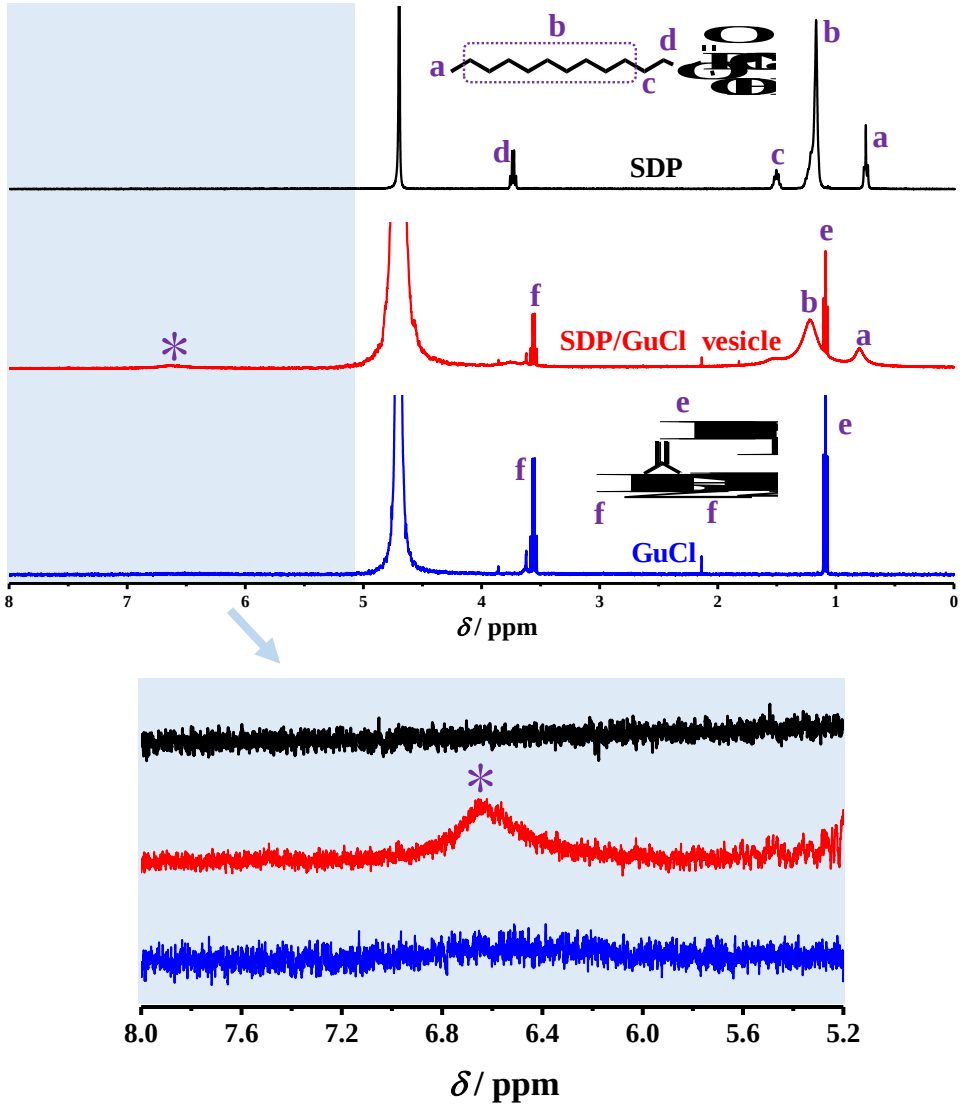

Fig. S9 ^{1}H NMR spectra of SDP, CuCl, and SDP/GuCl vesicle in D_2O.

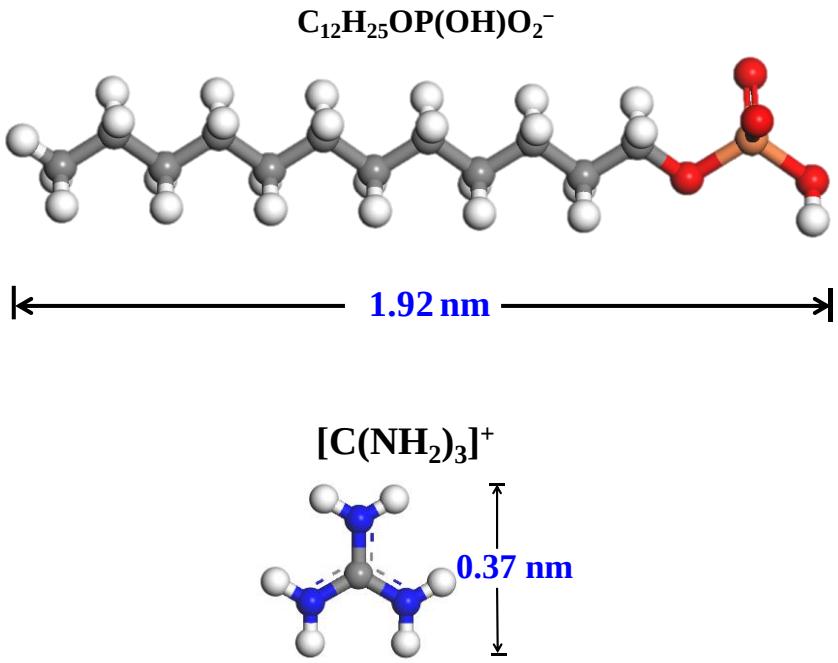

Fig. S10 Energy-minimized structures of sodium monododecylphosphate and guanidine via the density functional theory by Gaussian 9.0. The atom coloring scheme is: C, gray; H, white; P, orange; O, red; N, blue.

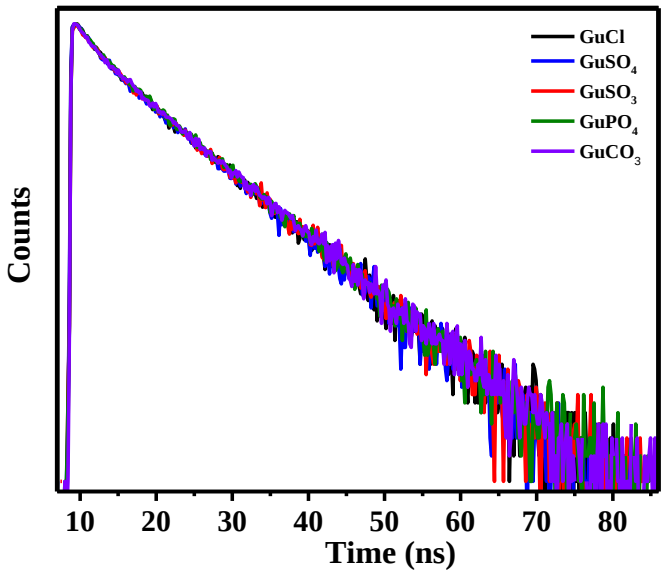

Fig. S11 Fluorescence intensity decay of DPH in SDP/GuSalt/H_2O solutions (0.15 wt% or ~5 mM SDP , 0.30 wt% GuSalt) at 25.0 °C (λ_{ex} = 377 nm, λ_{em} = 450 nm).

Table S2 Lifetime (τ_f), χ^2, and correlation time (τ_R) of DPH in SDP/GuSalt/H_2O solutions (0.15 wt% or ~5 mM SDP , 0.30 wt% GuSalt) at 25.0 °C.

GuSalt	τ_f (ns)	χ^2	τ_R (ns)
GuCl	9.66, 2.49	1.02	3.69
$GuSO_4$	9.62, 2.29	1.01	3.18
$GuSO_3$	9.82, 2.62	0.98	3.25
$GuPO_4$	9.76, 2.46	0.95	3.23
$GuCO_3$	9.83, 2.27	0.95	2.79

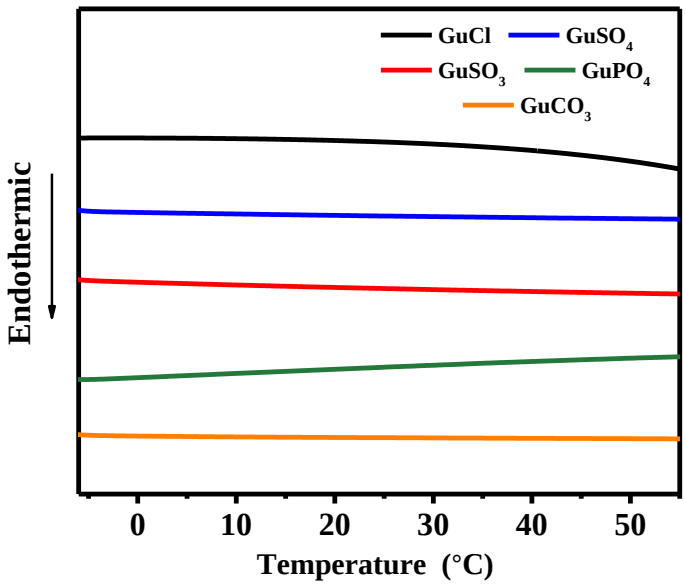

Fig. S12 DSC trace for SDP/GuSalt/H_2O systems (~5 mM or 0.15 wt% SDP, 0.30 wt% GuSalt).

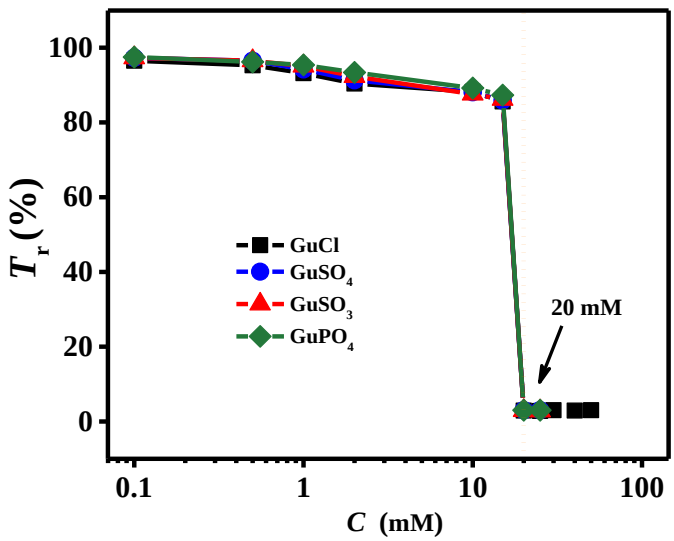

Fig. S13 Change of T_r with SDP concentration (C) for SDP/GuSalt/H_2O solutions at 8.0 °C.

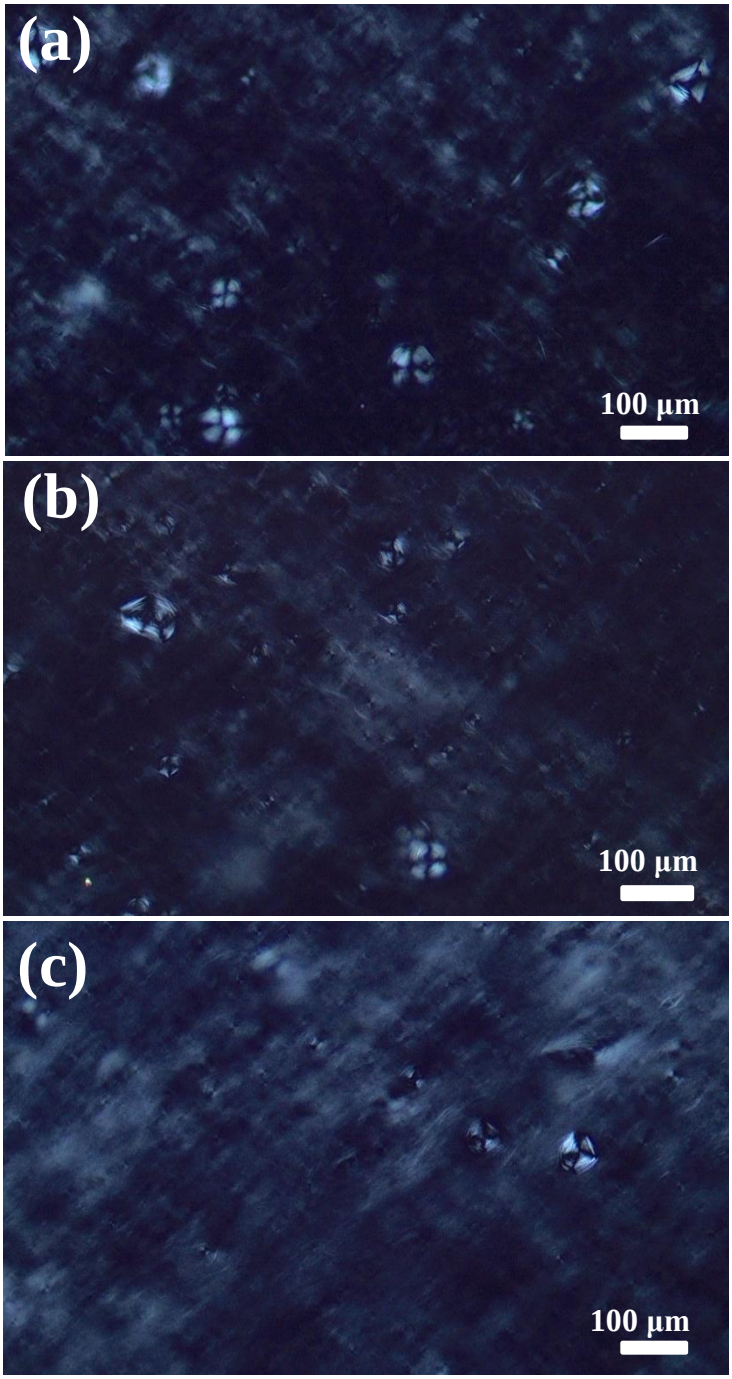

Fig. S14 Polarizing micrographs of SDP/GuSalt/H_2O systems (0.90 wt% SDP, 0.55 wt% GuSalt) at 8.0 °C. (a) $GuSO_4$, (b) $GuSO_3$, and (c) $GuPO_4$.

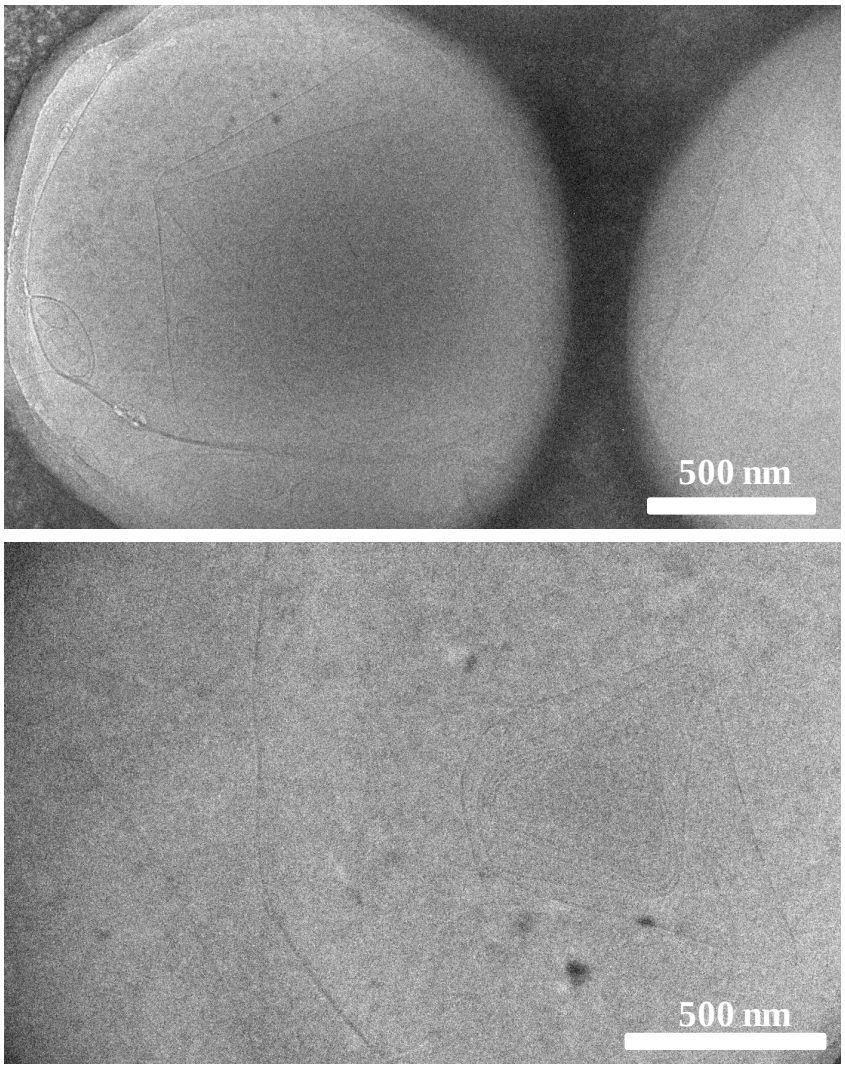

Fig. S15 Cryo-TEM images of SDP/GuCl/H_2O system (0.90 wt% SDP, 0.55 wt% GuCl) at 8.0 °C.

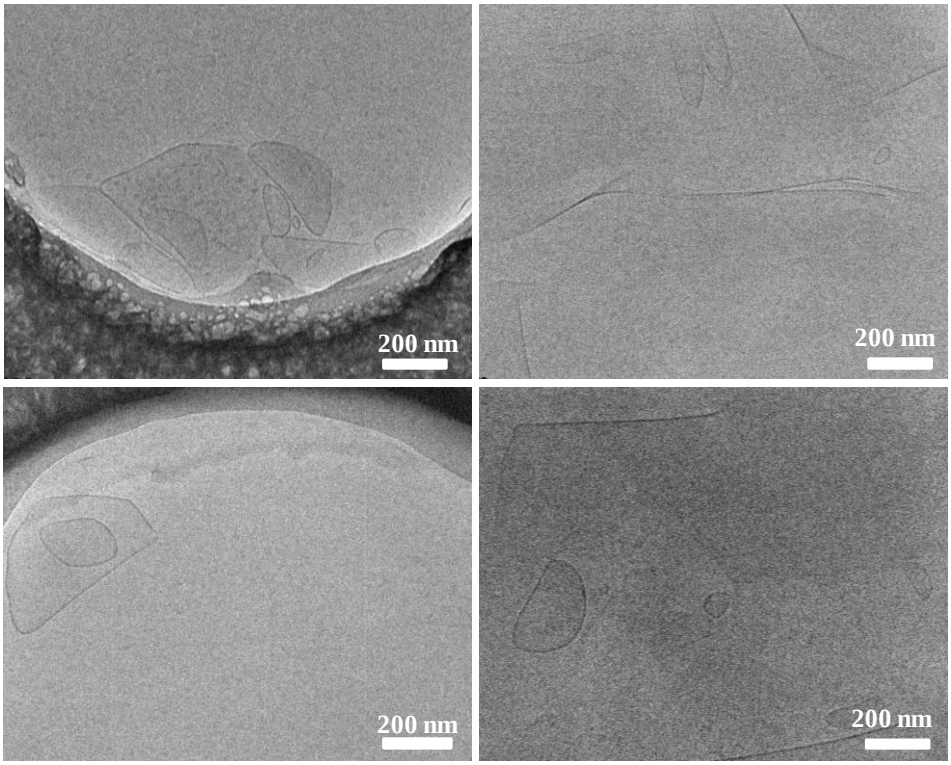

Fig. S16 Cryo-TEM images of SDP/$GuPO_4$/H_2O system (0.90 wt% SDP, 0.55 wt% $GuPO_4$) at 8.0 °C.

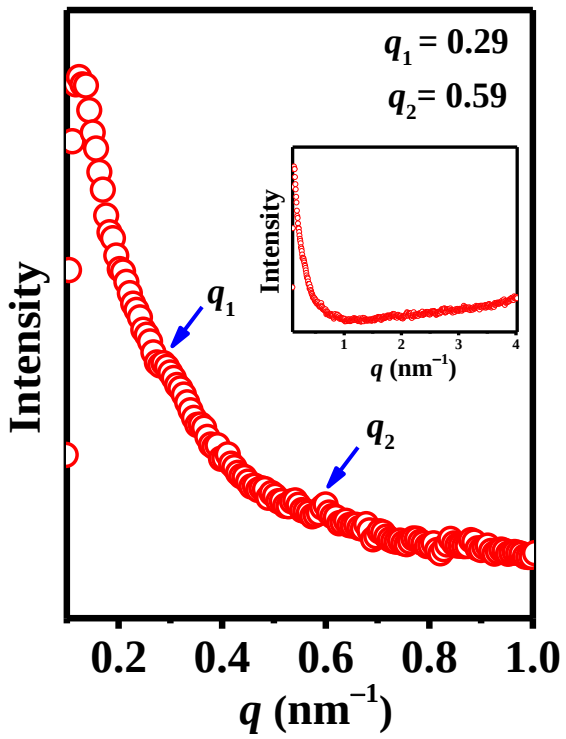

Fig. S17 Small-angle X-ray scattering curve of SDP/GuCl/H_2O systems (0.90 wt% SDP, 0.55 wt% GuCl) at 8.0 °C. The scattering peaks for the system can be indexed as a lamellar structure.

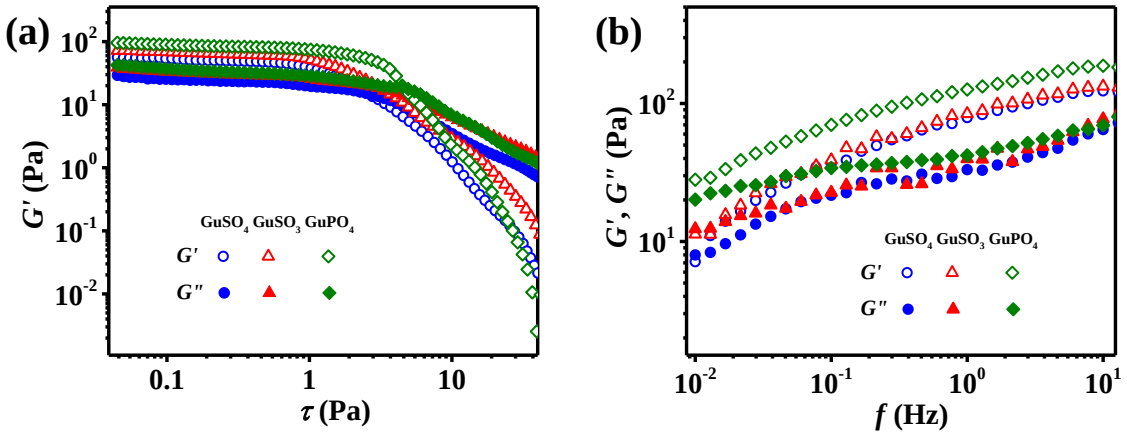

Fig. S18 (a) Stress sweep and (b) frequency sweep of gel samples for SDP/GuSalt/H_2O systems (0.90 wt% SDP, 0.55 wt% GuSalt) at 8.0 °C.

Reference

[S1] G. S. James, Lange's Handbook of Chemistry 16th: McGraw-Hill, 2005.