

Supplementary Materials

Protic Ionic Liquid Cation Alkyl Chain Length Effect on Lysozyme Structure

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Table S1. Weight percentage (wt%) of PILs corresponding to molar concentrations (mol%) in PIL-water mixtures in this study.

PILs	Molecular Weight	PIL Concentration in mol%						
		0.1	0.5	1	5	10	20	50
EAN	108.1	0.6	3	5.7	24	40	60	85.7
BAN	136.1	0.8	3.6	7	28.6	45.7	65.4	88.4
HAN	164.2	1	4.4	8.4	32.5	50.3	69.5	90.1
OAN	192.2	1.1	5.1	10	36	54.3	72.8	91.5

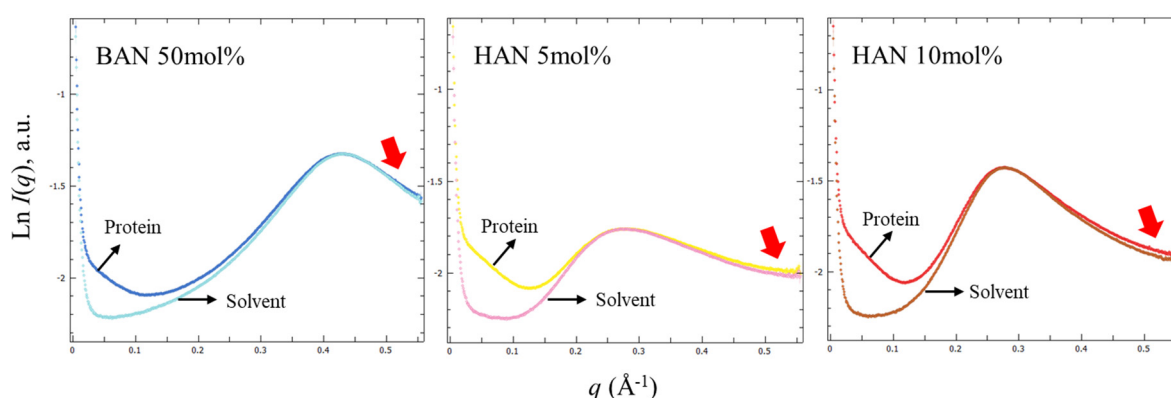


Figure S1. Examples of solvent subtraction in SAXS profile for PIL-water mixtures (the solvent sample) with the broad peak due to the liquid nanostructures. Accurate solvent subtraction was not achieved for BAN 20 and 50 mol%, HAN 5–50 mol%, or OAN 5–10 mol%. The arrows indicate the unmatched high q region which render subtraction prone to artefacts.

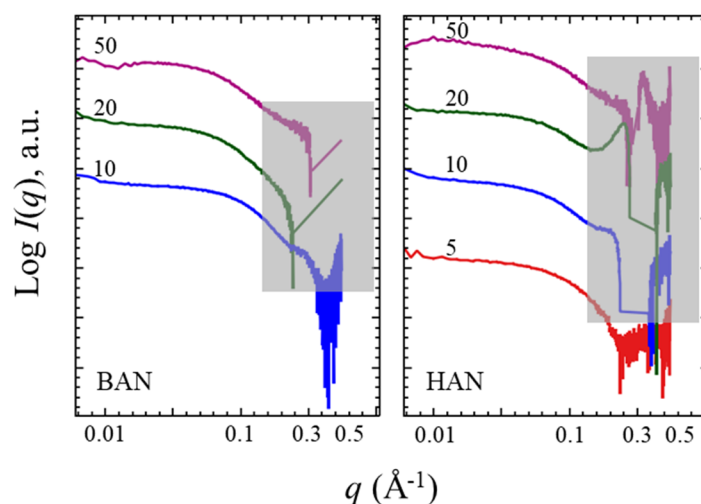


Figure S2. SAXS profiles of lysozyme in concentrated BAN and HAN solutions with large contribution of liquid nanostructure of the PIL shown in the grey area. The numbers on the plots refer to the PIL concentration in mol%. The details for estimating R_g are provided in Table S2.

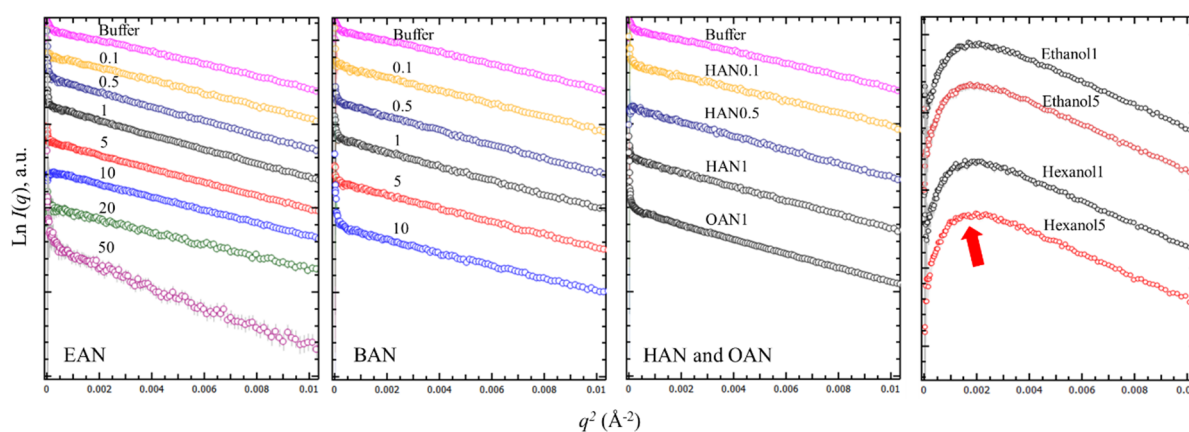


Figure S3. Guinier plots of lysozyme in the PIL-water mixtures compared with buffer. The range for calculating R_g values are obtained from the ATSAS 3.01 software. The detailed parameters were provided in Table S2. An offset was applied for easier comparison of the samples. The arrow refers to the Guinier plot (the “frowning” Guinier) owing to the repulsive inter-particle interactions in ethanol and hexanol solutions. The numbers on the plots refer to the PIL concentration in mol%.

Table S2. Details of SAXS parameters of data analysis.

PIL-Water Mixtures (mol%)	Guinier R_g (Å) [std.err]	qR_g (max)	Data Points for Calculating R_g
pH 8	14.27 ± 0.09	1.21	0.01
EAN0.1 mol%	14.96 ± 0.11	1.29	9–102
EAN0.5 mol%	16.11 ± 0.13	1.25	18–91
EAN1 mol%	16.22 ± 0.08	1.29	20–118
EAN5 mol%	15.71 ± 0.07	1.29	15–122
EAN10 mol%	15.32 ± 0.08	1.29	19–125
EAN20 mol%	15.22 ± 0.21	1.3	9–103
EAN50 mol%	19.81 ± 0.62	1.29	20–76
BAN0.1 mol%	15.11 ± 0.12	1.29	17–101
BAN0.5 mol%	16.07 ± 0.12	1.28	15–94
BAN1 mol%	15.98 ± 0.14	1.29	11–95
BAN5 mol%	15.44 ± 0.11	1.29	14–99
BAN10 mol% *	15.71 ± 0.37	0.95	19–70
BAN20 mol% *	20.86 ± 0.33	1.26	19–70
BAN50 mol% *	20.87 ± 0.50	1.26	19–70
HAN0.1 mol%	14.64 ± 0.12	1.3	16–105
HAN0.5 mol%	15.88 ± 0.12	1.28	10–95
HAN1 mol%	15.94 ± 0.11	1.27	16–94
HAN5 mol% *	19.29 ± 0.62	1.17	19–70
HAN10 mol% *	21.85 ± 0.26	1.32	19–70
HAN20 mol% *	20.62 ± 0.45	1.25	19–70
HAN50 mol% *	23.91 ± 0.58	1.45	19–70
OAN1 mol%	15.93 ± 0.10	1.3	64–121

* The R_g of lysozyme in concentrated BAN and HAN solutions was estimated by the SAXS pattern (Figure S2) where specified data points for calculating R_g was employed.