Supplementary Information

Efficient extraction of polystyrene nano plastics from water via Ionic Liquid

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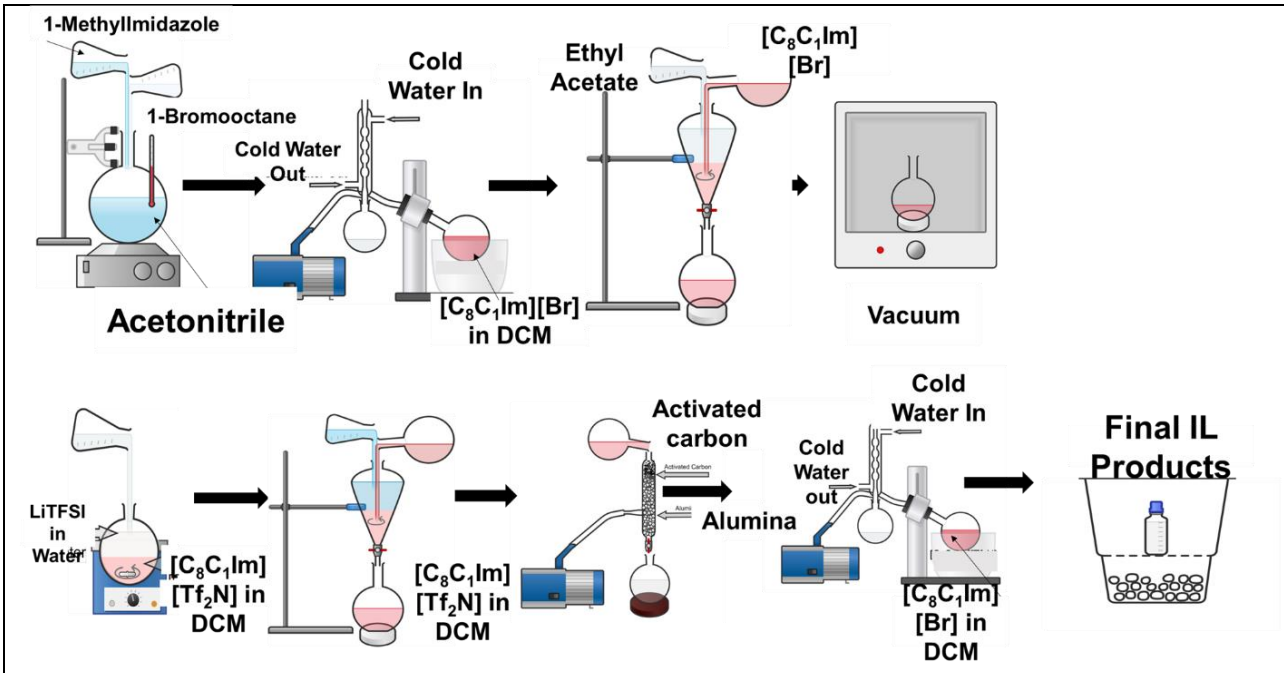

Figure S1. The schematic represent the synthesis of the $[C_8C_1Im][Tf_2N]$ via multistep procedure steps including **1)** The reaction of 1-bromooctane with 1-methylimidazole at 80° C for 48 h **2)** the Concentrating process at 10 torr for complete removal of acetonitrile, **3)** A liquid-liquid extraction procedure with ethyl acetate serving as the extracting solvent, **4)** The organic phase subjected to vacuum drying to effectively remove residual solvents, **5)** Initiation of the metathesis reaction by introducing lithium bistriflimide ($LiTf_2N$), **6)** The organic solution containing dichloromethane (DCM) undergoing a series of water washes, for ten times, **7)** Purification to remove impurities by activated carbon and then with alumina bed column; **8)** A concentration process ensuring the removal of any remaining solvent trace.

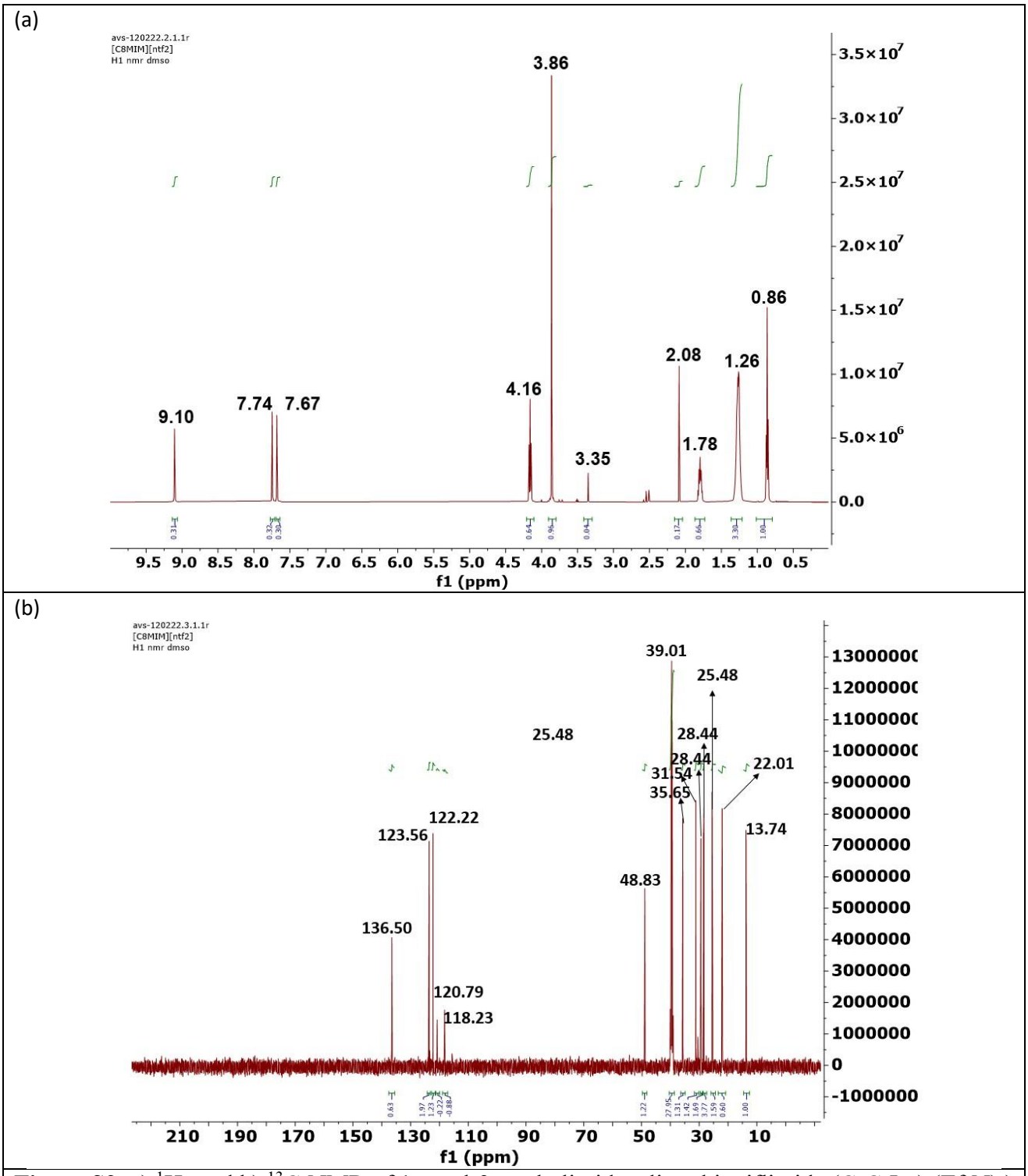

Figure S2. a) ^{1}H- and b) ^{13}C-NMR of 1-octyl-3-methylimidazolium bistriflimide (C_8C_1Im) (Tf_2N)) in DMSO-d6

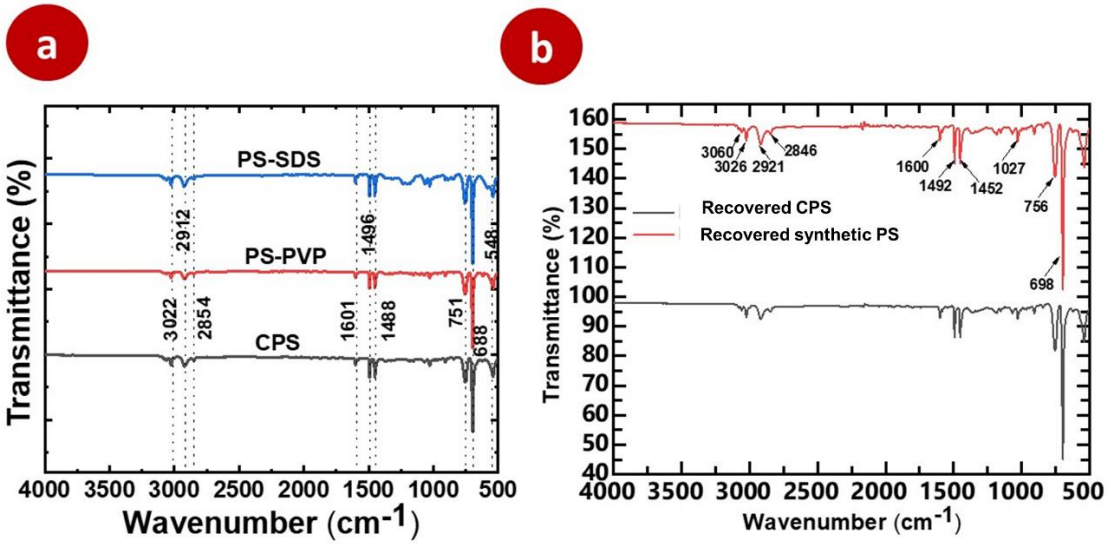

Figure S3. FTIR spectroscopy of (a) pure PS and (b) recovered PS

Table S1. Total Organic Carbon (TOC) and conductivity of Lake Tuscaloosa water changes with the addition of $[C_8C_1Im]$ $[Tf_2N]$

	Conductivity (before extraction)	Conductivity (after extraction)	TOC after extraction (ppm)
DI water	2.71	-	
Lake Tuscaloosa water sample	65.01	-	3.40±0.99
CPS	68.41	153.1	3.99 ± 0.14
PS-SDS	223.1	267.3	3.56 ± 0.63
PS-PVP	68.79	223.1	3.40 ± 0.58

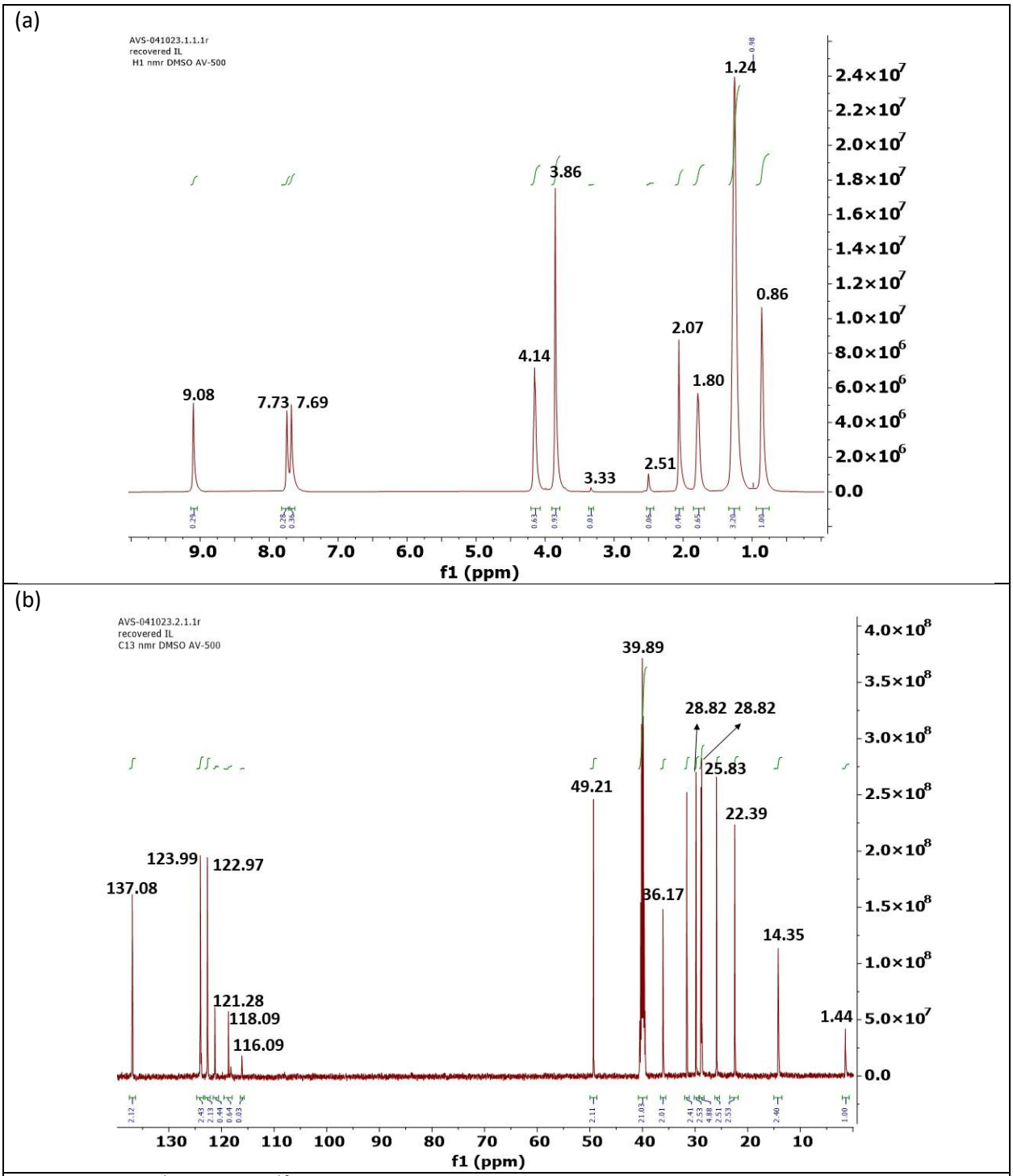

Figure S4. a) ^{1}H- and b) ^{13}C-NMR of recovered 1-octyl-3-methylimidazolium bistriflimide $[C_8C_1Im][[Tf_2N]$ in DMSO-d6

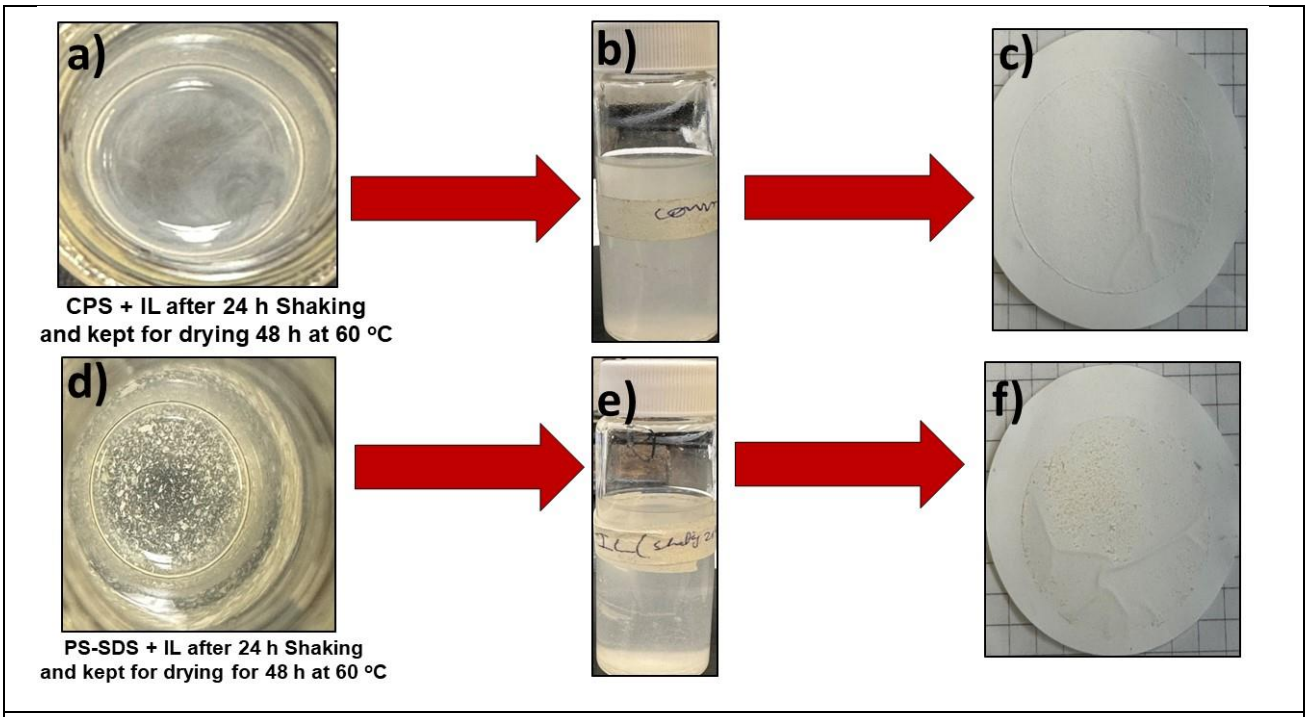

Figure S5. Regeneration of PS+IL by the addition of acetonitrile and filtered over the membrane

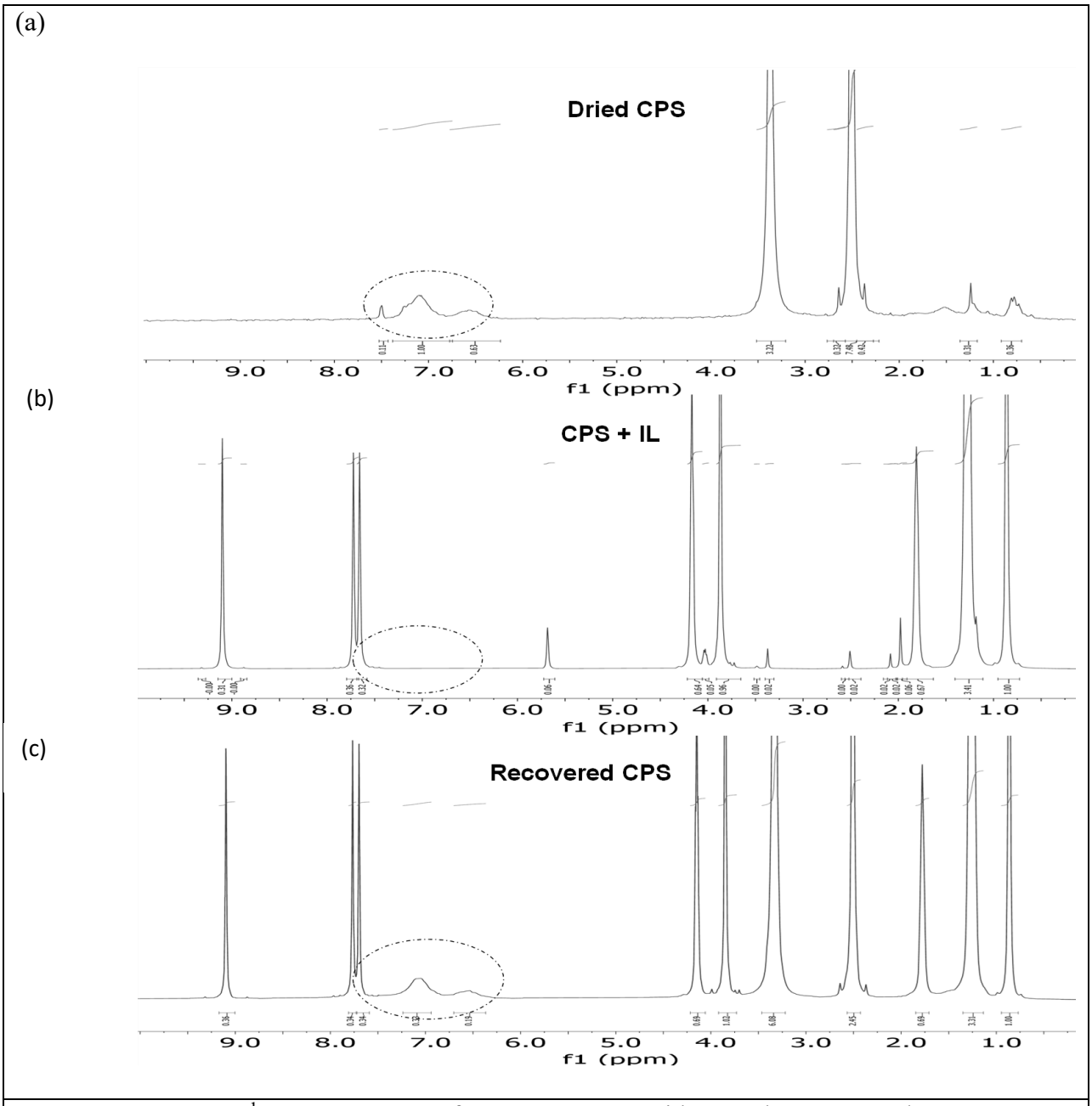

Figure S6. ^{1}H NMR spectra of **a)** CPS, **b)** CPS with IL and **c)** recovered CPS