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Supplementary Information

Silica based ionogels: interfaces effects with aprotic and protic ionic liquids with lithium

A Marie, B Said, A Galarneau, T Stettner, A Balducci, M Bayle, B Humbert and J. Le Bideau

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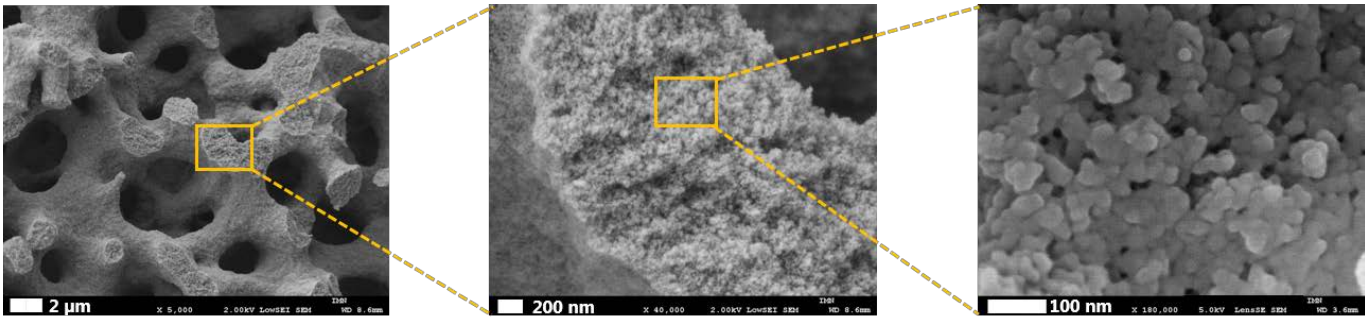

Fig. S1 SEM image of silica monolith

Table S1 Mass fraction and volume of ILs in impregnated silica

	Pyr14TFSI-based ionogels		Pyr14-LiTFSI-based ionogels		PyrH4TFSI-based ionogels		PyrH4-LiTFSI-based ionogels	
Ø $_{meso\ (N2)}$ (nm)	%wt IL	$V_{total\ (14)}$ (cm^3/g of silica)	%wt IL	$V_{total\ (14-Li)}$ (cm^3/g of silica)	%wt IL	$V_{total\ (H4)}$ (cm^3/g of silica)	%wt IL	$V_{total\ (H4-Li)}$ (cm^3/g of silica)
8.1	82.5± 0.2	3.40 ± 0.05	82.6 ± 0.3	3.32 ± 0.06	81.9 ± 0.1	3.15 ± 0.01	82.36 ± 0.02	3.24 ± 0.00
8.5	81.9± 0.1	3.26 ± 0.01	82.0 ± 0.4	3.19 ± 0.08	82.1 ± 0.7	3.2 ± 0.1	82.4 ± 0.6	3.3 ± 0.1
9.8	83.0± 0.5	3.5 ± 0.1	84.0 ± 0.4	3.7 ± 0.1	84 ± 1	3.6 ± 0.3	82.9 ± 0.7	3.4 ± 0.1
11.2	82.8± 0.1	3.47 ± 0.02	83.1 ± 0.2	3.44 ± 0.05	83.7 ± 0.8	3.6 ± 0.2	83.75 ± 1	3.6 ± 0.2
12.6	83.4± 0.1	3.62 ± 0.04	83.3 ± 0.3	3.49 ± 0.07	83.02 ± 0.05	3.41 ± 0.01	83.2 ± 0.1	3.43 ± 0.02
16.2	*84.3± 0.1*	*3.87 ± 0.02*	*84.5 ± 0.2*	*3.80 ± 0.05*	*84.38 ± 0.01*	*3.770 ± 0.002*	*84.44 ± 0.00*	*3.77 ± 0.00*

Density at 30°C: Pyr14TFSI 1.3906 ; Pyr14TFSI + 0.5M LiTFSI 1.4319 ; PyrH4TFSI 1.4326 ; PyrH4TFSI+0.5M LiTFSI 1.4397

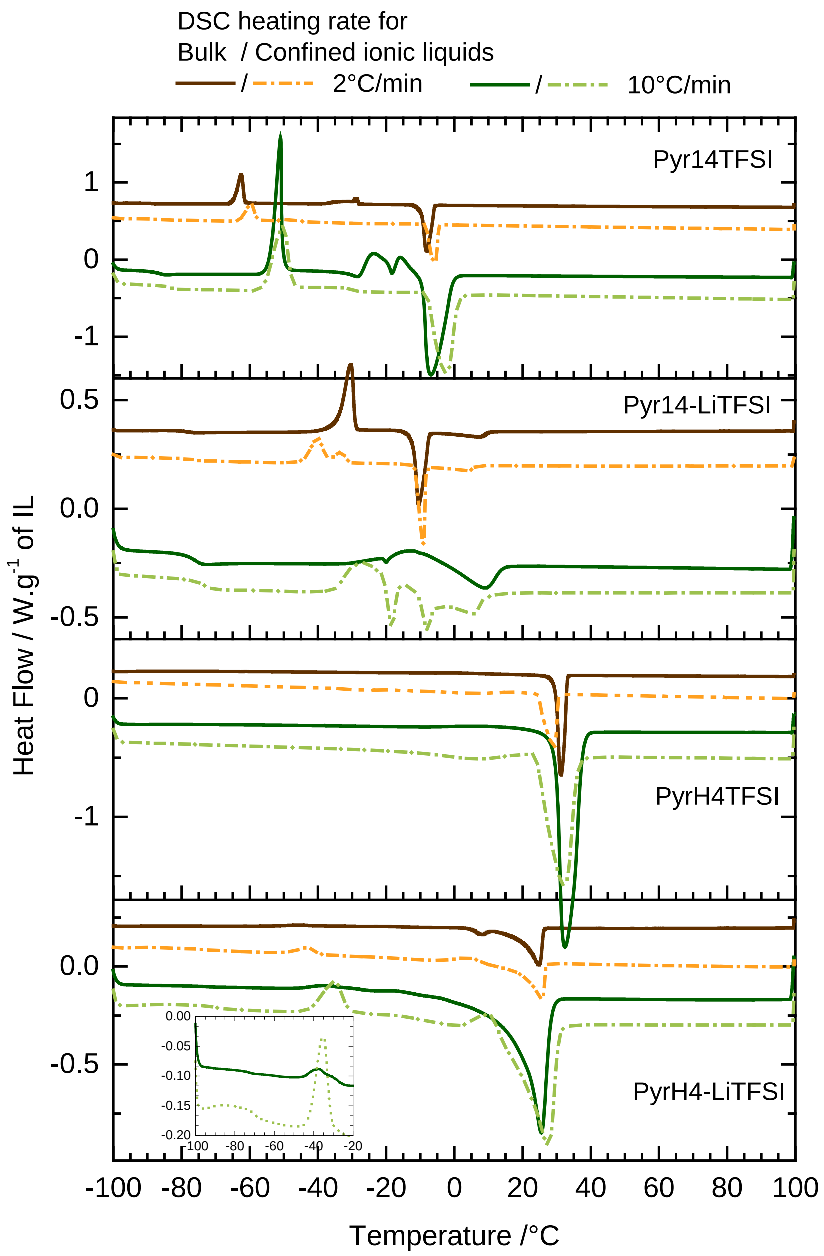

Fig. S2: DSC thermogram of ionic liquids, in bulk state and for a confinement in 11.2 nm meso-porous silica. From top to bottom: Pyr14TFSI, Pyr14-LiTFSI, PyrH4TFSI and PyrH4-LiTFSI. Inset: glass transition of PyrH4-LiTFSI.

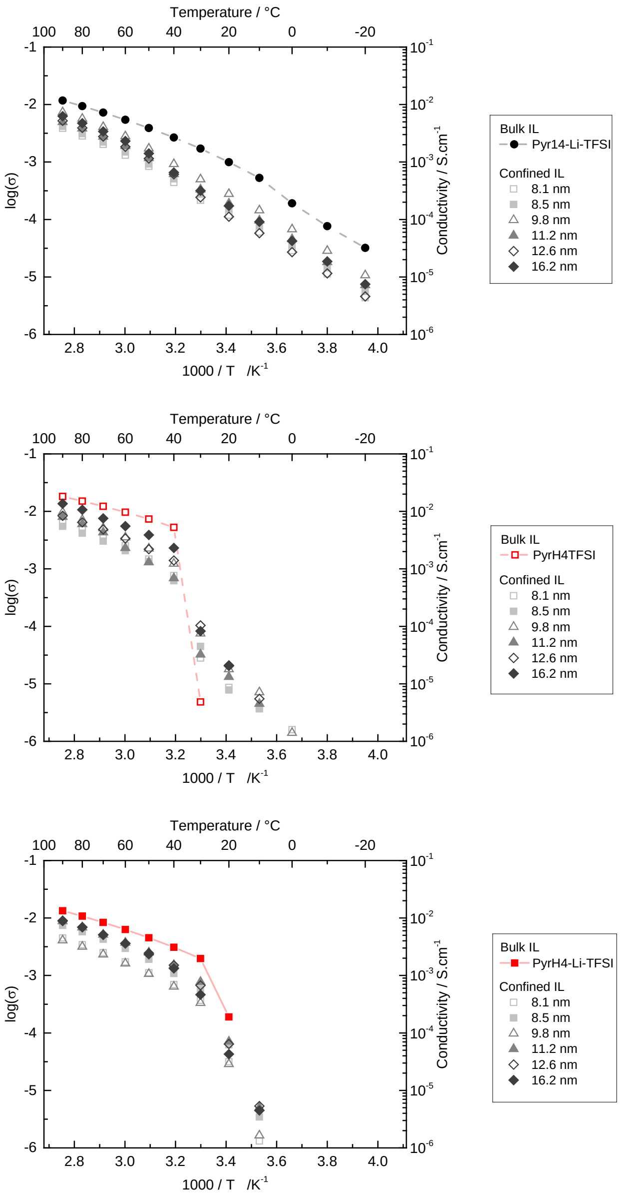

Fig. S3: Conductivity of Pyr14TFSI, PyrH4TFSI and PyrH4-Li-TFSI bulk ionic liquids and ionogels.

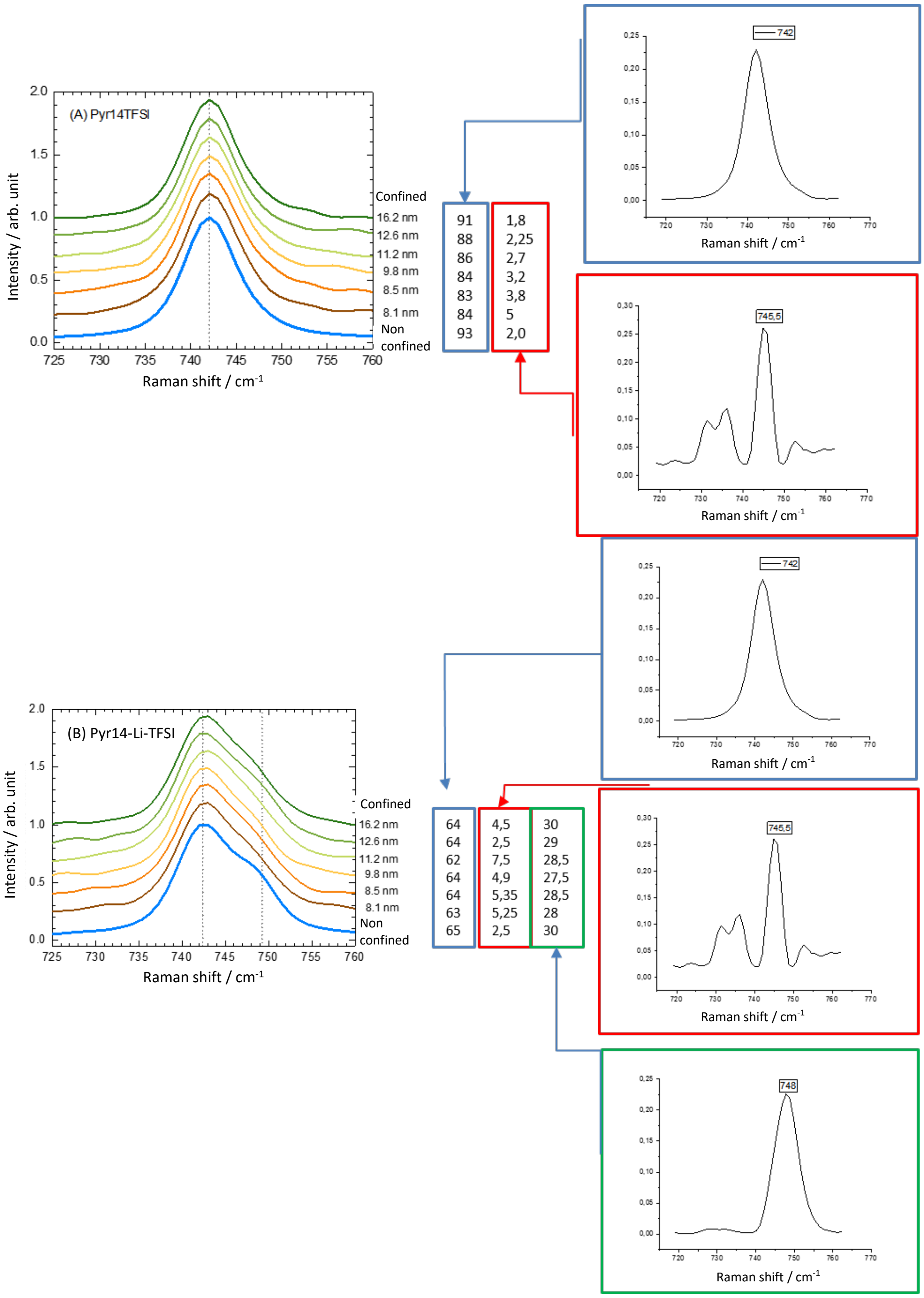

Fig. S4:-BPSS. Examples of BPSS algorithm application, for Pyr14TFSI bulk and confined (A) without Li^+ and (B) with 0.5 M of Li^+. The weight of each source is noted in column, in front of mesopore sizes.

Table S2: Fitting parameters obtained for non-confined and confined Pyr14-LiTFSI (named by meso-pore size). *fixed parameters

Fitted component	Parameter	Pyr14-LiTFSI	8.1 nm	8.5 nm	9.8 nm	11.2 nm	12.6 nm	16.2 nm
	y0	0.016	0.009	0.005	0.008	0.008	0.005	0.007
C1	xc*	741.8	741.7	741.7	741.7	741.7	741.7	741.7
	A	2.24	0.63	0.53	0.55	0.80	0.57	0.66
	$6 < \omega < 8$	6.56	6.67	6.67	6.33	7.69	6.66	6.39
	μ *	0.68	0.68	0.68	0.68	0.68	0.68	0.68
C2	xc*	743	743	743	743	743.01	743	743
	A	1.44	1.23	1.06	1.2	1.2	0.67	1.41
	$6 < \omega < 9$	7.50	7.77	7.77	7.73	7.78	7.77	8.00
	μ *	0.74	0.74	0.74	0.74	0.74	0.74	0.74
C3	xc *	748.3	748.3	748.3	748.3	748.3	748.3	748.3
	A	1.28	0.45	0.39	0.36	0.51	0.37	0.50
	$6 < \omega < 7.2$	7.14	7	7	6.2	7.2	7	7
	μ *	0	0	0	0	0	0	0

$$y = y_0 + A \times \left[\mu \frac{2}{\pi} \frac{\omega}{4(x - x_c)^2 + \omega^2} + (1 - \mu) \frac{\sqrt{4 \ln 2}}{\omega\sqrt{\pi}} \exp\left(-\frac{4 \ln 2}{\omega^2}(x - x_c)^2\right) \right]$$

With y_0 : offset , x_c : peak centre, A : peak area, μ : profil shape factor (% of Lorentzian) and ω : FWHM.

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Table S3: Fitting parameters obtained for non-confined and confined PyrH4-LiTFSI (named by meso-pore size). *fixed parameters

Fitted component	Parameter	PyrH4-LiTFSI	8.1 nm	8.5 nm	9.8 nm	11.2 nm	12.6 nm	16.2 nm
	y0	0.007	0.004	0.004	0.004	0.005	0.0034	0.004
C1	xc*	743.06	743.06	743.06	743.06	743.06	743.06	743.06
	A	1.98	0.44	0.76	0.95	0.86	0.41	1.11
	ω < 8	7.75	7.75	7.75	7.75	7.75	7.75	7.75
	μ *	0.68	0.68	0.68	0.68	0.68	0.68	0.68
C2	xc*	745	745	745	745	745	745	745
	A	1.72	0.33	0.47	0.57	0.41	0.59	0.57
	ω < 7	<u>7</u>	<u>7</u>	<u>7</u>	<u>7</u>	<u>7</u>	<u>7</u>	<u>7</u>
	μ *	0.74	0.74	0.74	0.74	0.74	0.74	0.74
C3	xc *	748.72	748.72	748.72	748.72	748.72	748.72	748.72
	A	0.60	0.03	0.19	0.3	0.25	0.16	0.34
	ω < 6.2	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>
	μ *	0	0	0	0	0	0	0

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