

Chiral Ionic Liquids Supported on Natural Sporopollenin Microcapsules

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Supporting Information

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^{13}C -MAS NMR spectra

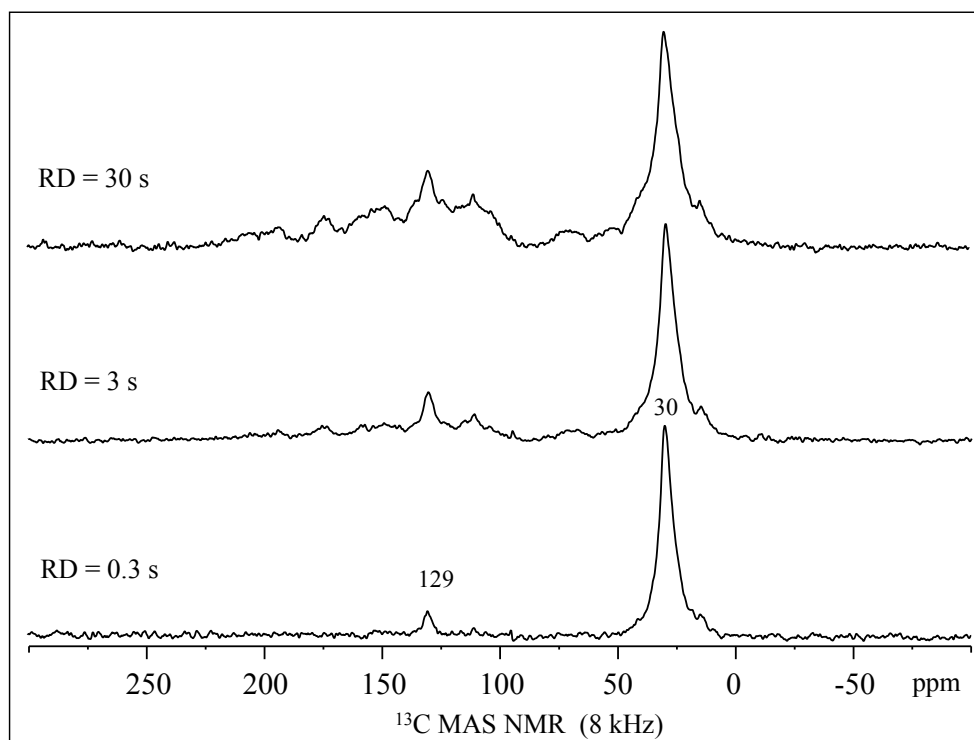


Figure S1. ^{13}C MAS NMR spectra of sporopollenin capsules (SEC) collected with varying relaxation delay (RD) times. The top spectrum was an average of 10.7 k scans (3.7 days). The other spectra are an average of 20 k scans.

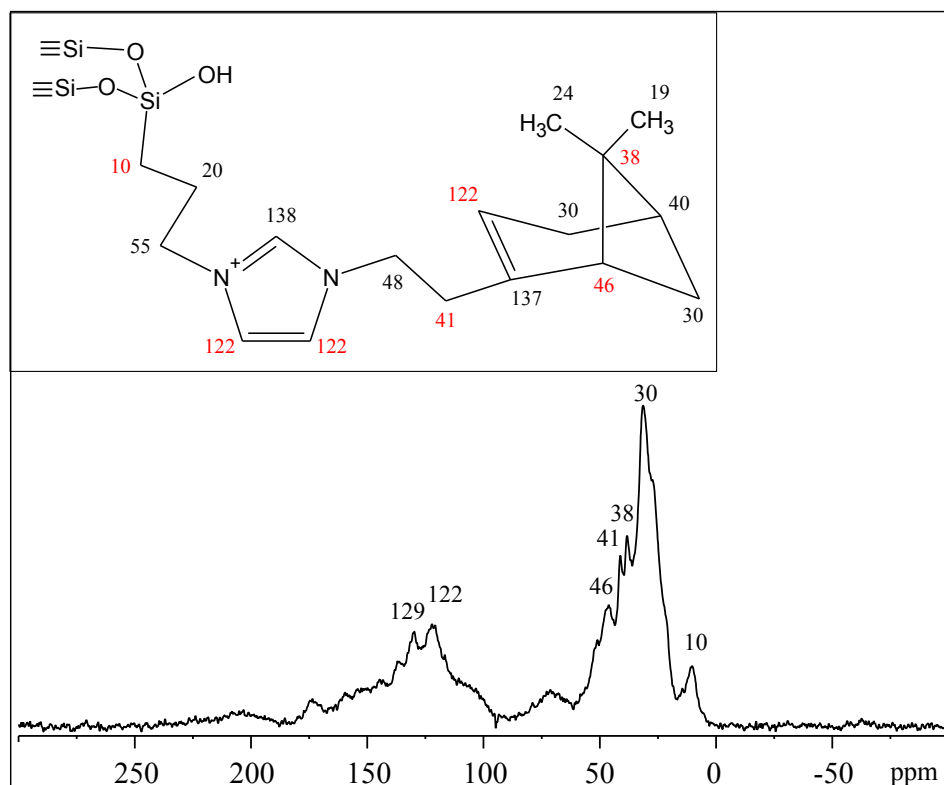
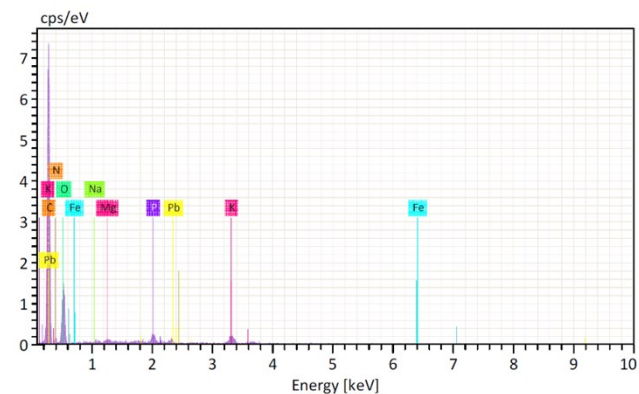


Figure S2. ^{13}C CP-MAS NMR spectrum of IL-functionalized sporopollenin **5a** with assignment of selected peaks according to chemical shifts estimated [1] for the functionalized ionic-liquid group.

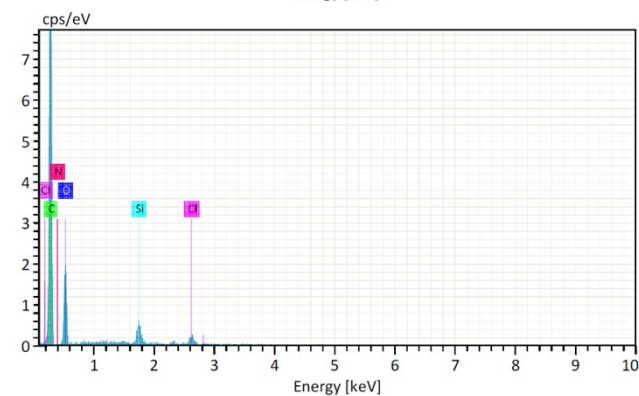
1) ^{13}C shifts estimated using ACD/ChemSketch version 2015.2.5

Energy-Dispersive X-ray spectra (EDX)



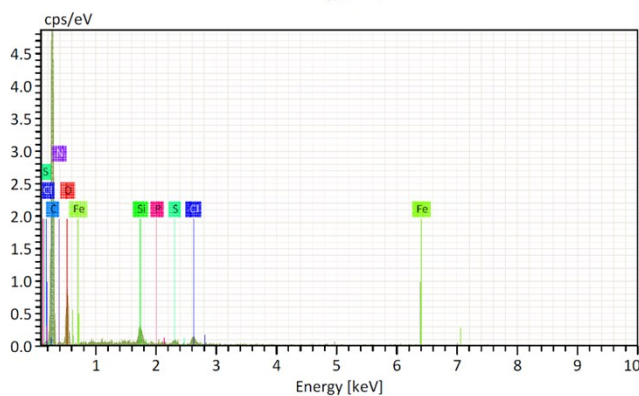
a)

Element	At. No.	Netto	Mass [%]	Atom [%]	abs. error [%] (1 sigma)
Carbon	6	6304	55.30	63.19	8.34
Nitrogen	7	125	5.77	5.66	2.67
Oxygen	8	2064	34.74	29.80	6.56
Sodium	11	2	0.01	0.01	0.01
Magnesium	12	71	0.20	0.11	0.06
Phosphorus	15	415	0.94	0.42	0.09
Potassium	19	509	2.14	0.75	0.15
Iron	26	0	0.00	0.00	0.00
Lead	82	140	0.89	0.06	0.12
Sum		100.00	100.00	100.00	



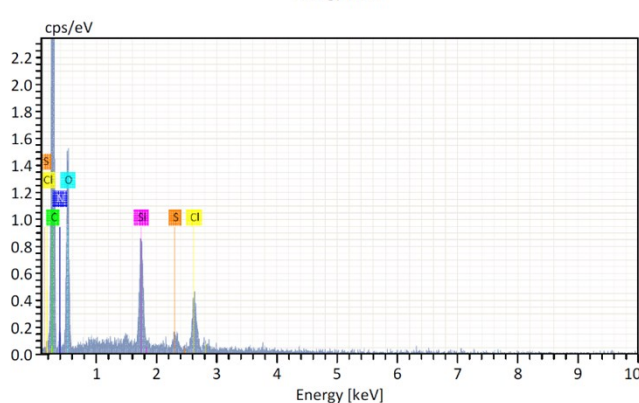
b)

Element	At. No.	Netto	Mass [%]	Atom [%]	abs. error [%] (1 sigma)
Carbon	6	14073	69.45	75.78	9.31
Nitrogen	7	33	1.02	0.95	0.83
Oxygen	8	2725	27.12	22.22	4.82
Silicon	14	1071	1.62	0.76	0.12
Chlorine	17	536	0.79	0.29	0.07
Sum		100.00	100.00	100.00	



c)

Element	At. No.	Netto	Mass [%]	Atom [%]	abs. error [%] (1 sigma)
Carbon	6	7932	71.43	77.43	10.38
Nitrogen	7	45	2.61	2.43	1.85
Oxygen	8	1206	23.40	19.04	5.06
Silicon	14	554	1.50	0.70	0.13
Phosphorus	15	0	0.00	0.00	0.00
Sulfur	16	121	0.28	0.12	0.06
Chlorine	17	255	0.77	0.28	0.09
Iron	26	0	0.00	0.00	0.00
Sum		100.00	100.00	100.00	



d)

Element	At. No.	Netto	Mass [%]	Atom [%]	abs. error [%] (1 sigma)
Carbon	6	10159	65.29	72.42	9.15
Nitrogen	7	165	5.38	5.12	2.24
Oxygen	8	2132	24.34	20.27	4.57
Silicon	14	1795	3.18	1.51	0.19
Sulfur	16	217	0.27	0.11	0.05
Chlorine	17	1021	1.53	0.57	0.10
Sum		100.00	100.00	100.00	

Figure S3: Energy-Dispersive X-ray spectra of a) pristine *Populus deltoides* pollen, b) 3-chloropropyl-functionalized sporopollenin CPS-SSP, c) IL-functionalized sporopollenin **5a**, d) IL-functionalized sporopollenin **5b**.

Thermal gravimetric analysis (TGA)

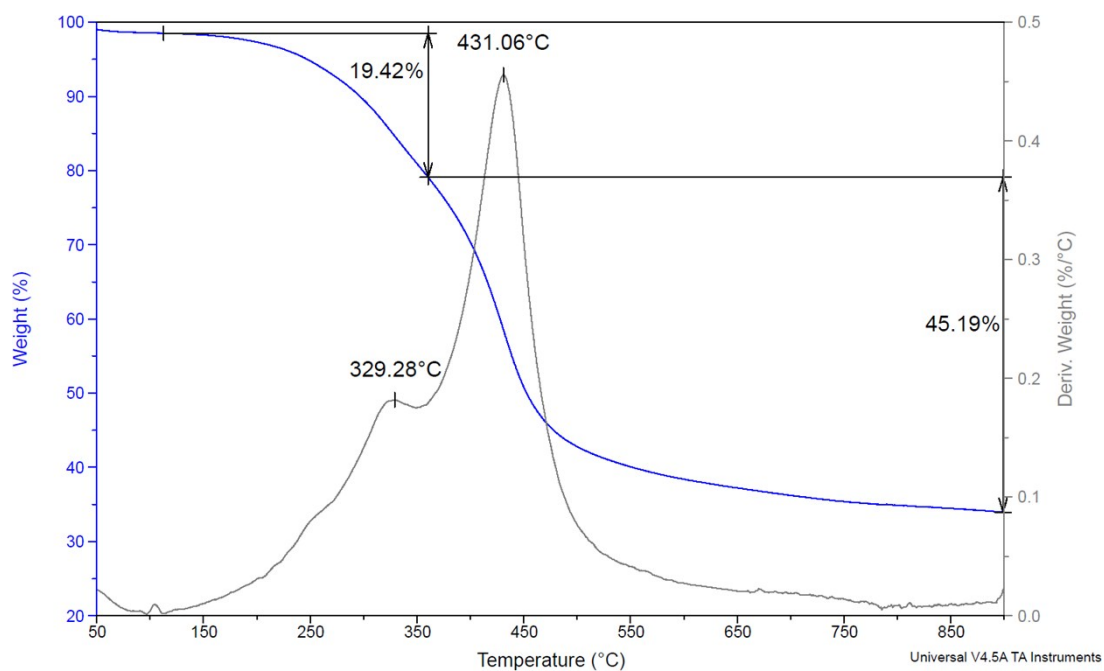


Figure S4 Thermal gravimetric analysis of sporopollenin.

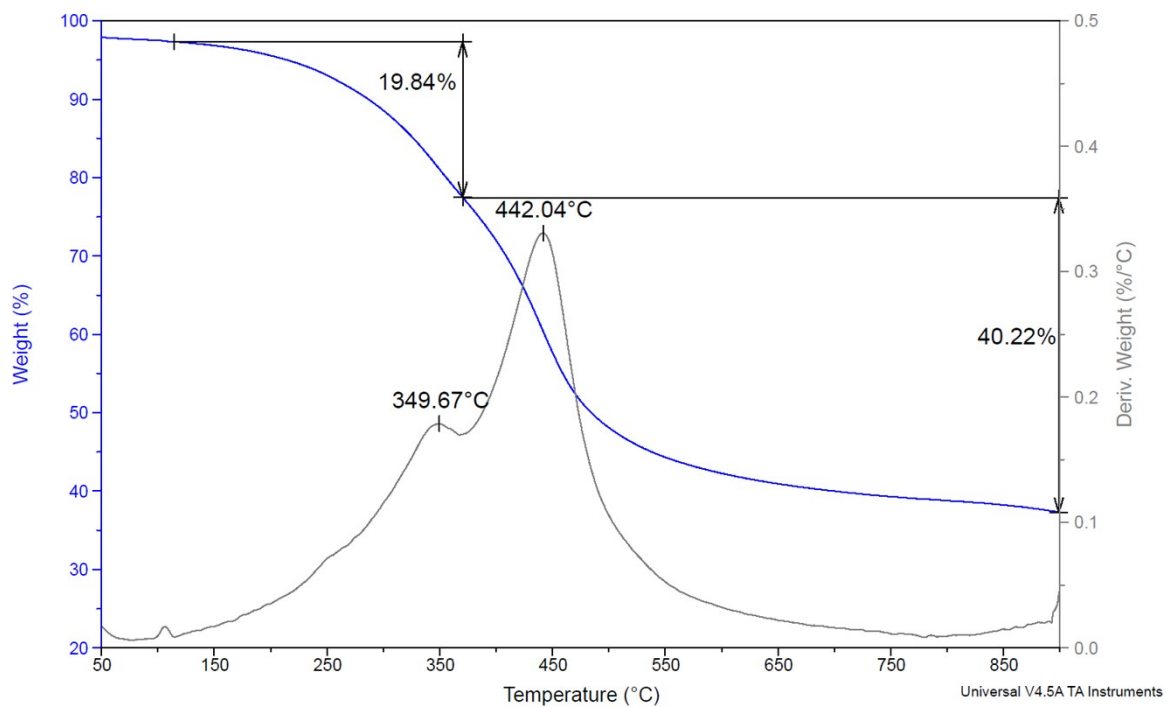


Figure S5 Thermal gravimetric analysis of 3-chloropropyl-functionalized sporopollenin CPS-SSP.

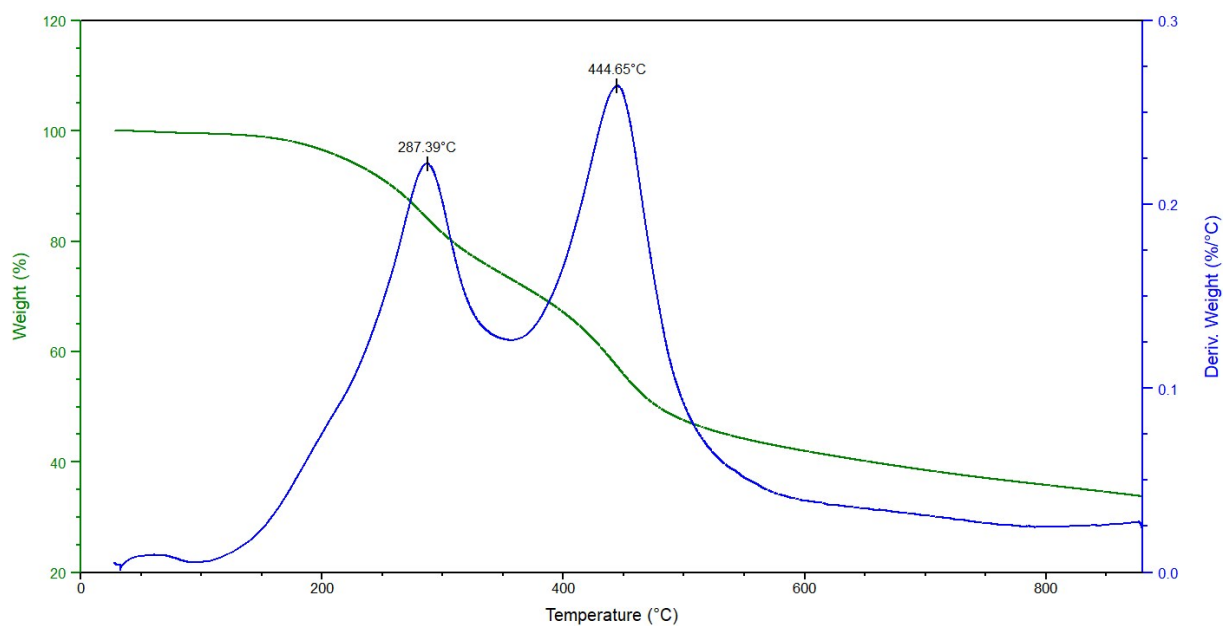


Figure S6 Thermal gravimetric analysis of IL-functionalized sporopollenin **5a**.

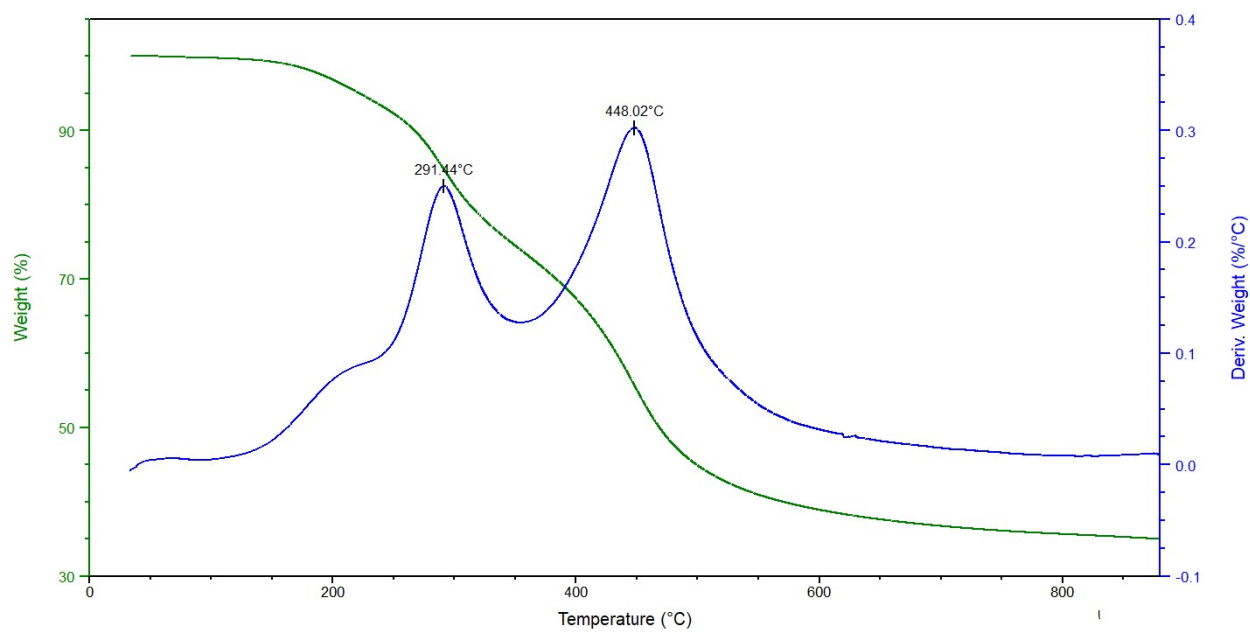


Figure S7 Thermal gravimetric analysis of IL-functionalized sporopollenin **5b**.

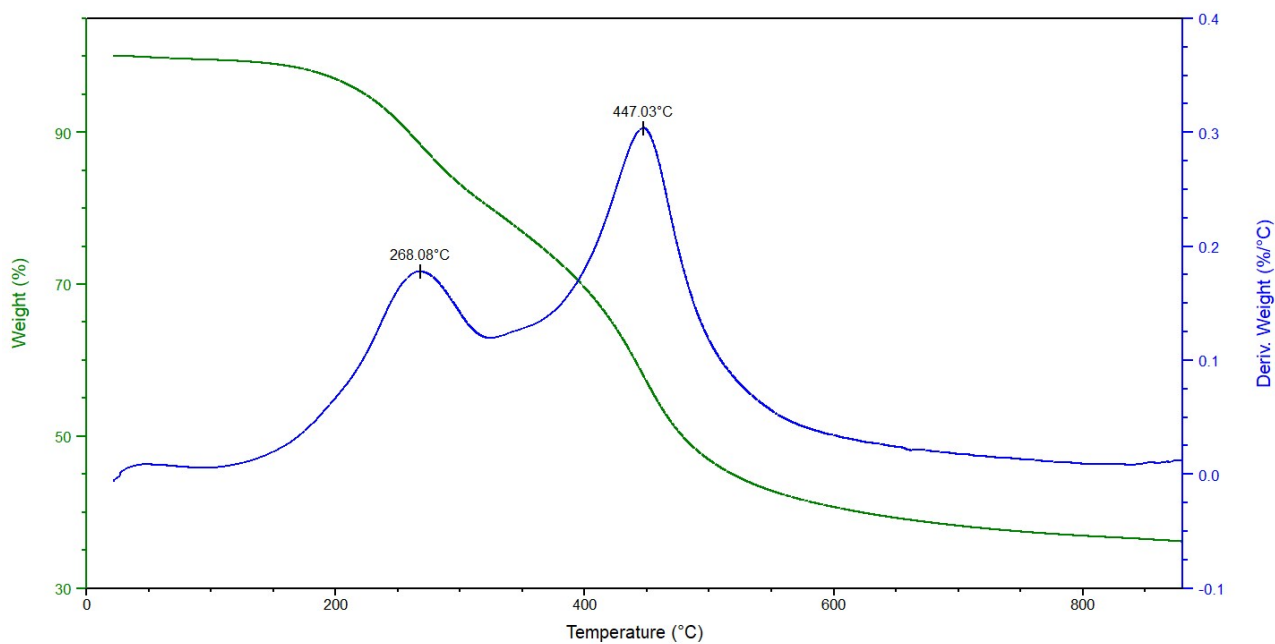


Figure S8 Thermal gravimetric analysis of IL-functionalized sporopollenin **5c**.

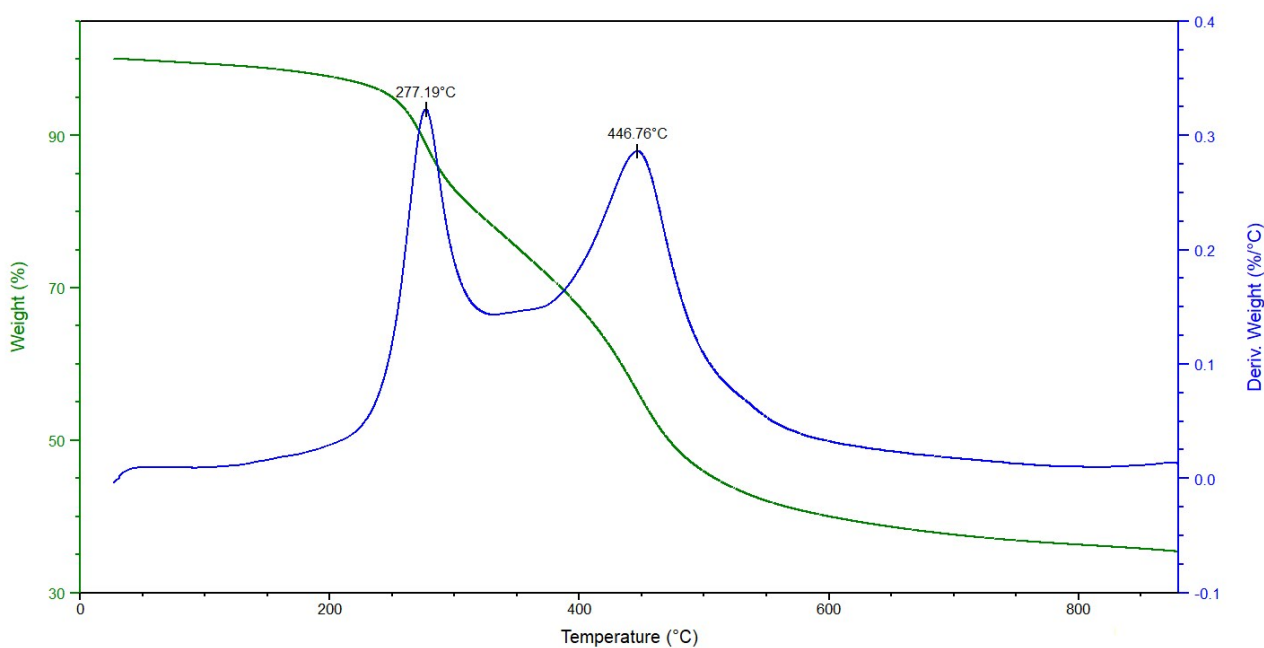


Figure S9 Thermal gravimetric analysis of IL-functionalized sporopollenin **5d**.

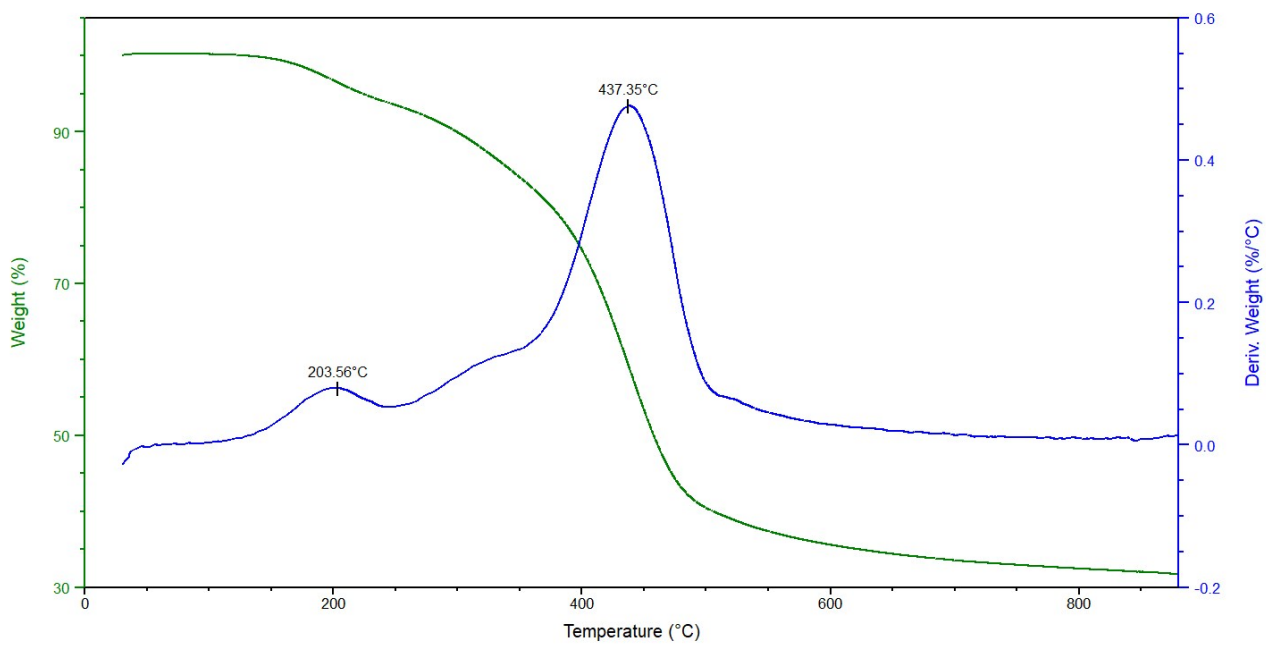


Figure S10 Thermal gravimetric analysis of IL-functionalized sporopollenin **6b**.

ATR-FTIR Spectra

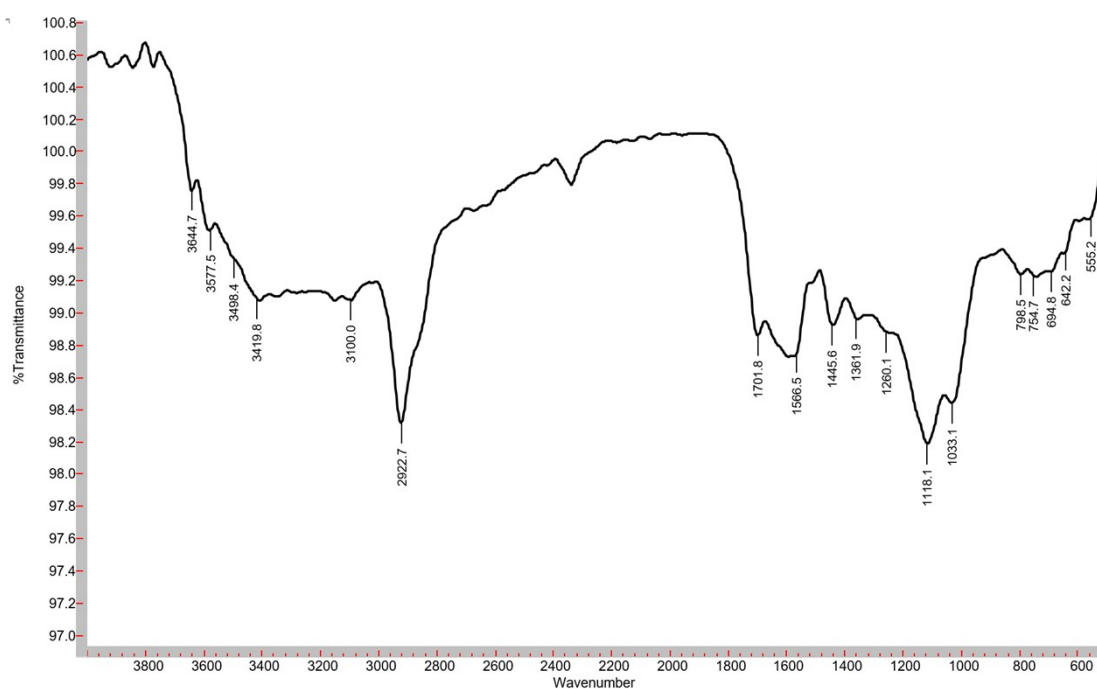


Figure S11 ATR-FTIR spectrum of IL-functionalized sporopollenin **5a**

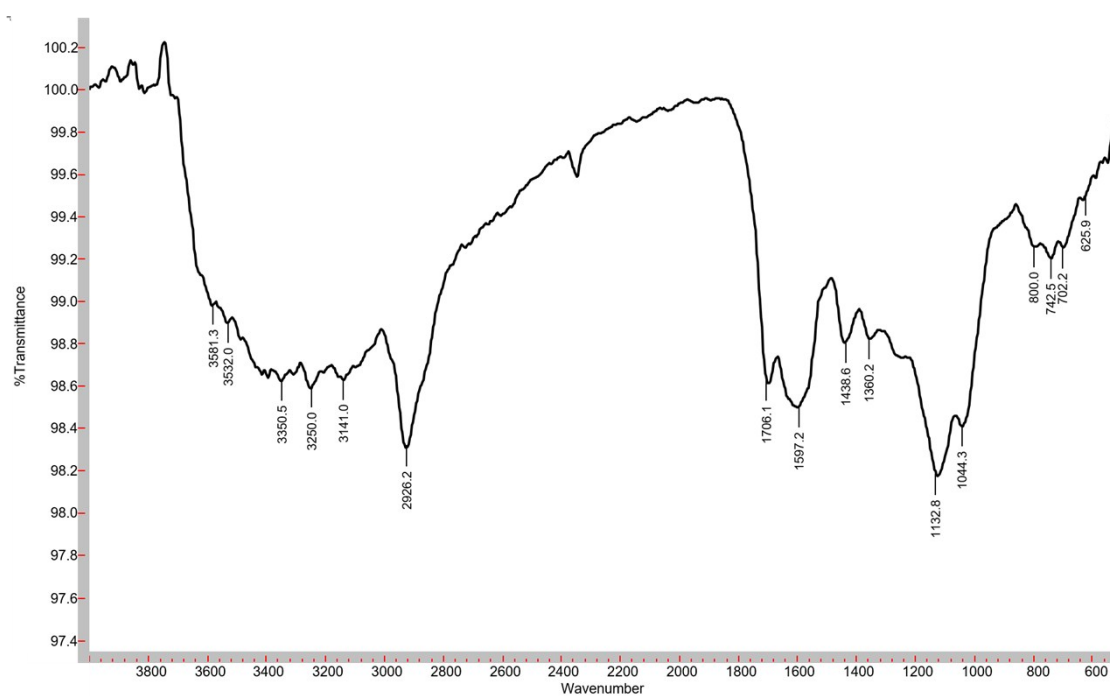


Figure S12 ATR-FTIR spectrum of IL-functionalized sporopollenin **5b**

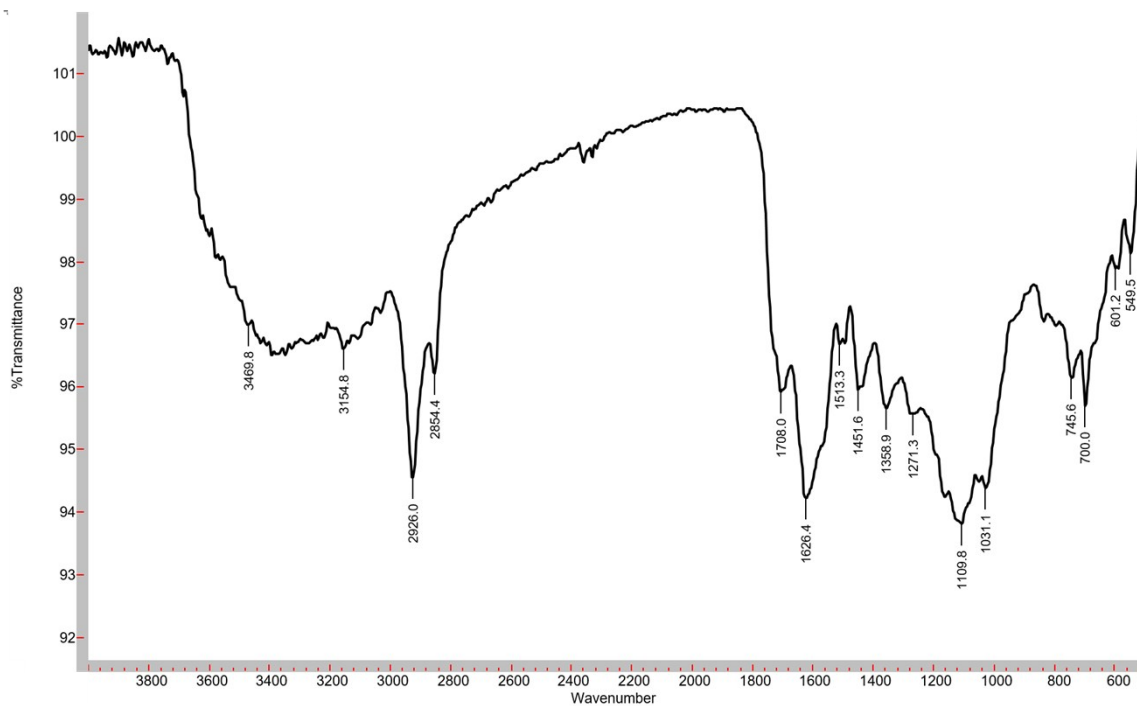


Figure S13 ATR-FTIR spectrum of IL-functionalized sporopollenin **5d**

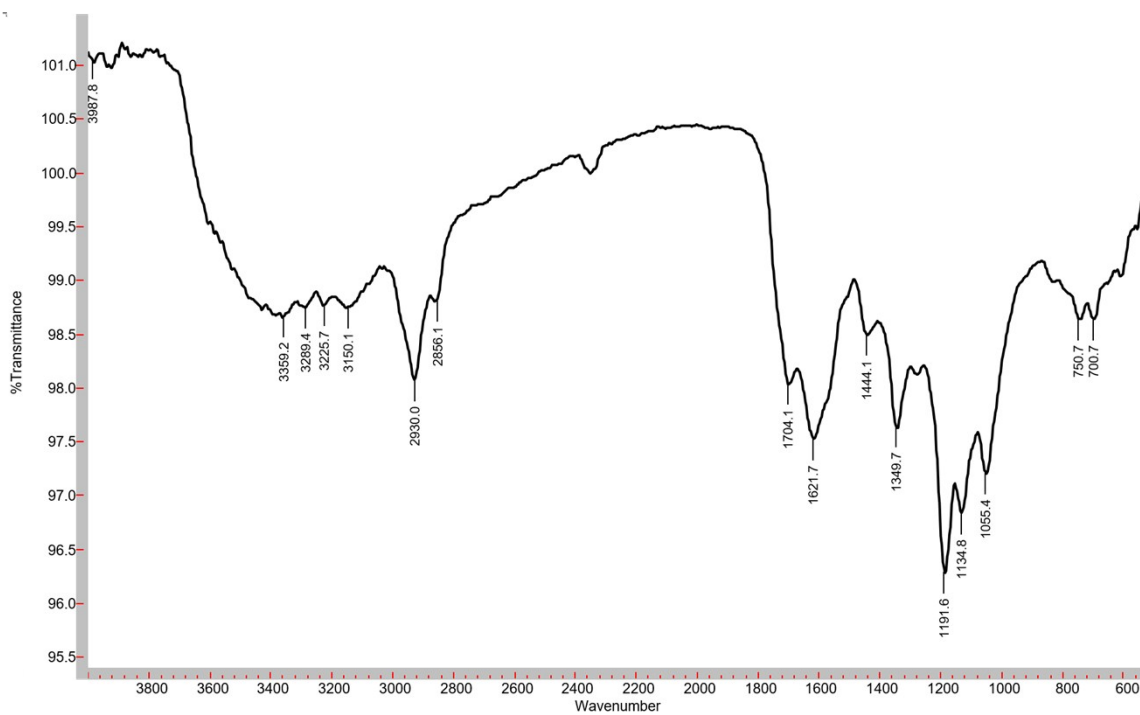


Figure S14 ATR-FTIR spectrum of IL-functionalized sporopollenin **6d**.

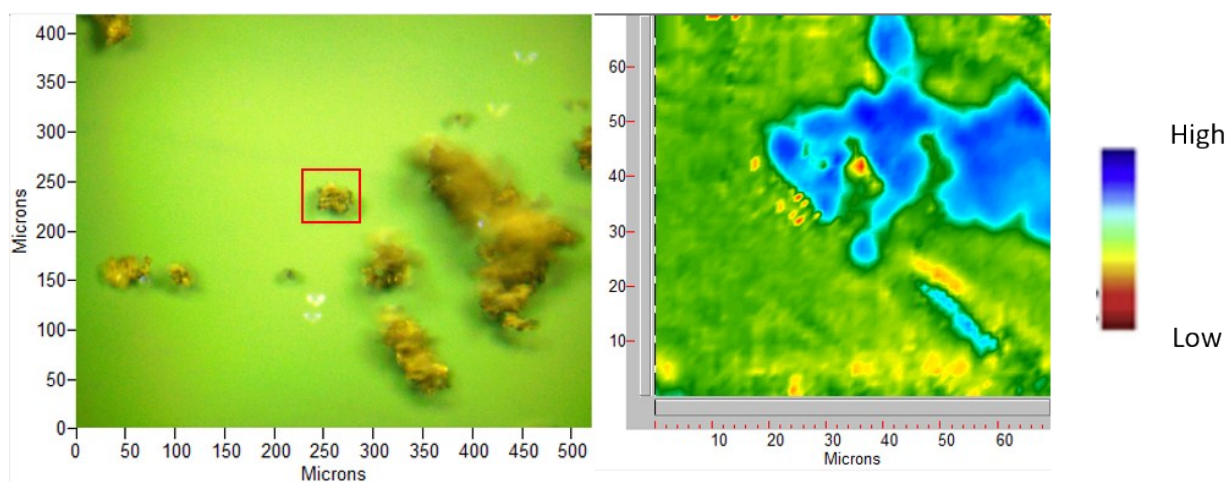


Figure S15 Visible and FPA images of IL-functionalized sporopollenin **5a** (selected wavenumber:1563 cm^{-1})

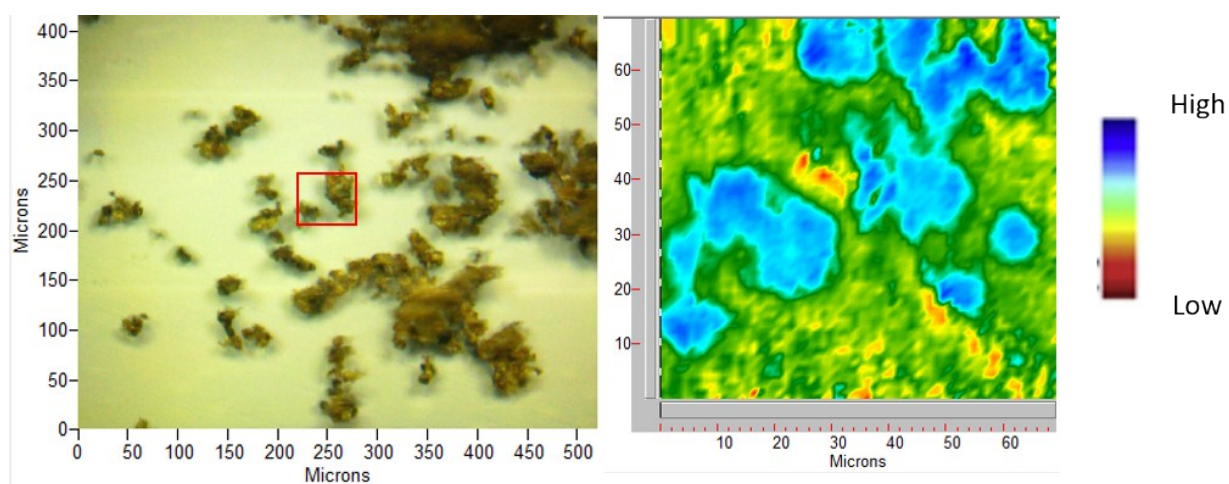


Figure S16 Visible and FPA images of IL-functionalized sporopollenin **5c** (selected wavenumber:1563 cm^{-1})

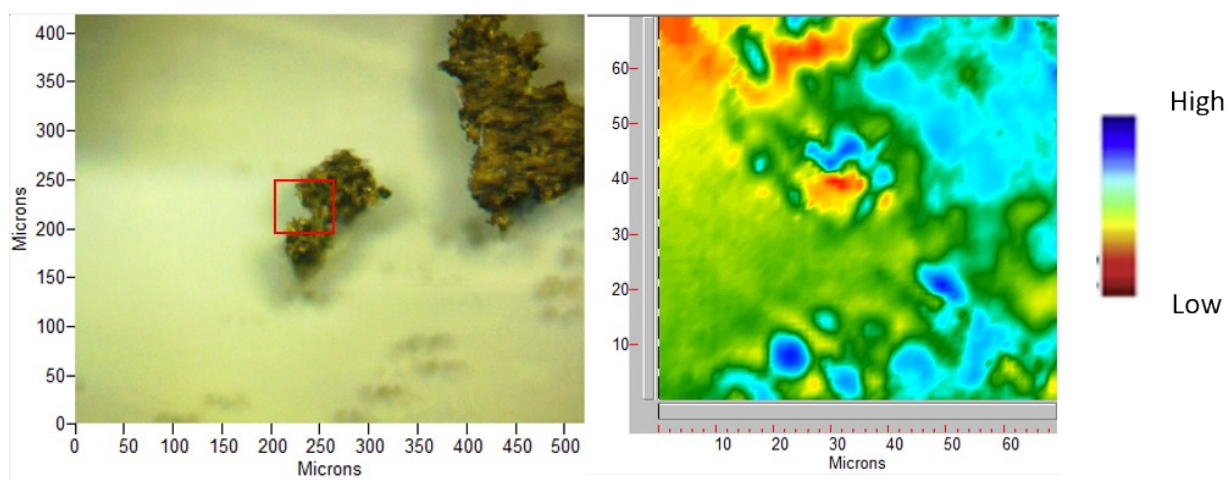


Figure S17 Visible and FPA images of IL-functionalized sporopollenin **5d** (selected wavenumber:1563 cm^{-1})

Scanning Electron Microscopy (SEM) images

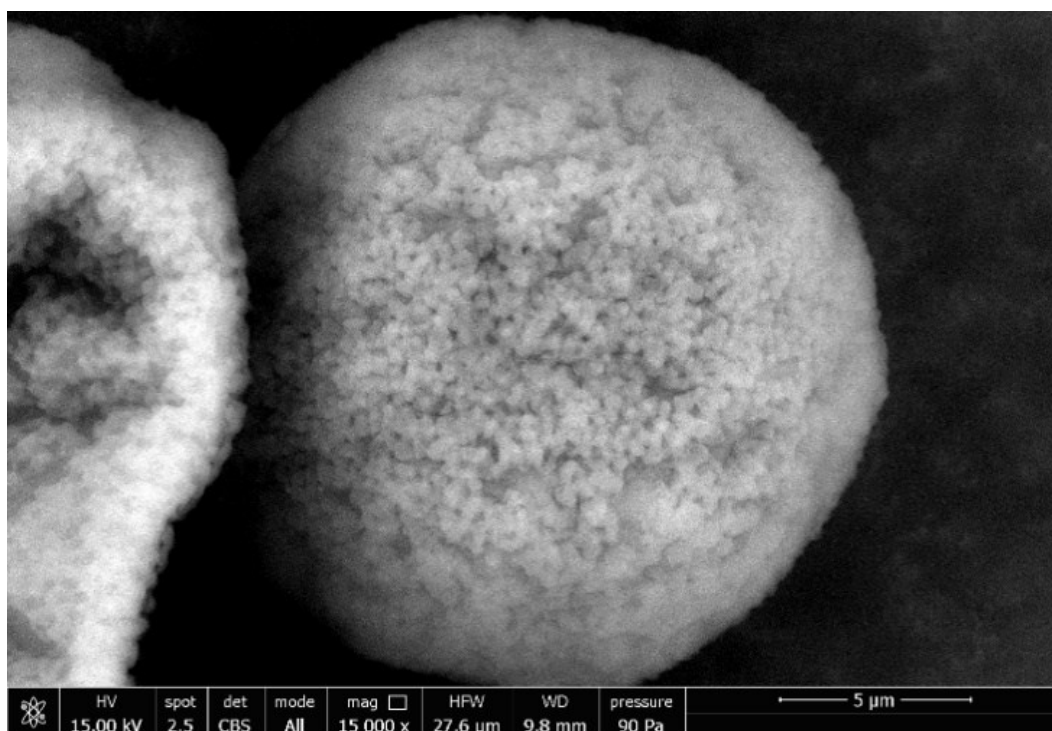


Figure S18 SEM micrograph of *Populus deltoides* pristine pollen

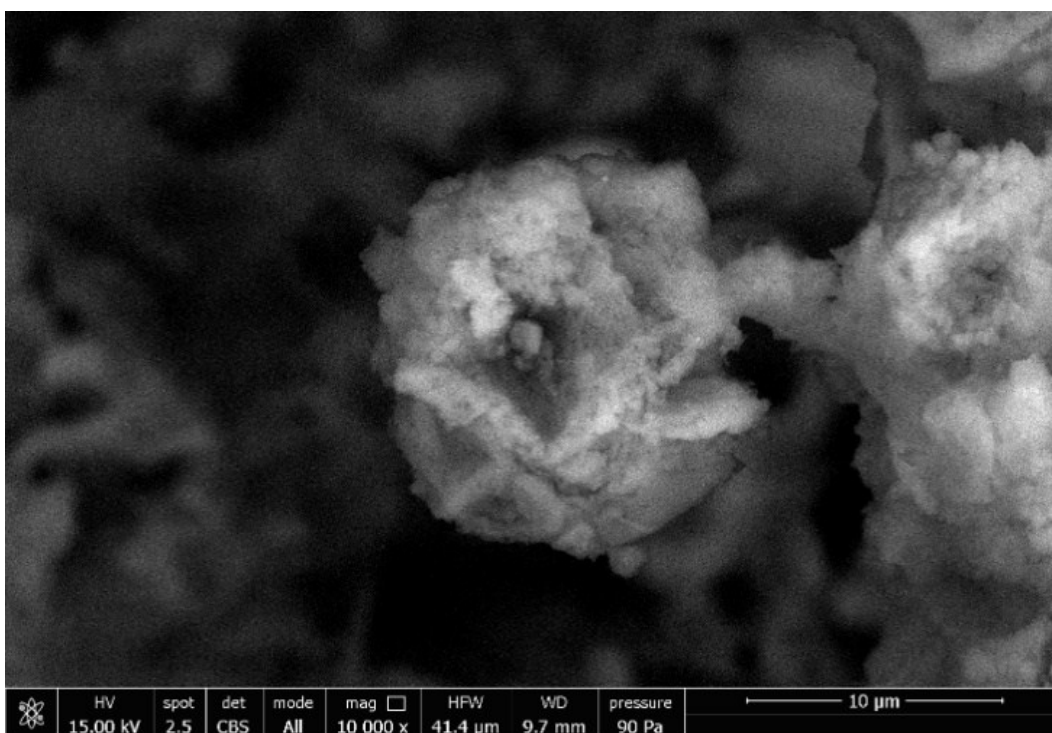


Figure S19 SEM micrograph of sporopollenin extracted with $[C_4MIMSO_3H]HSO_4$ ionic liquid

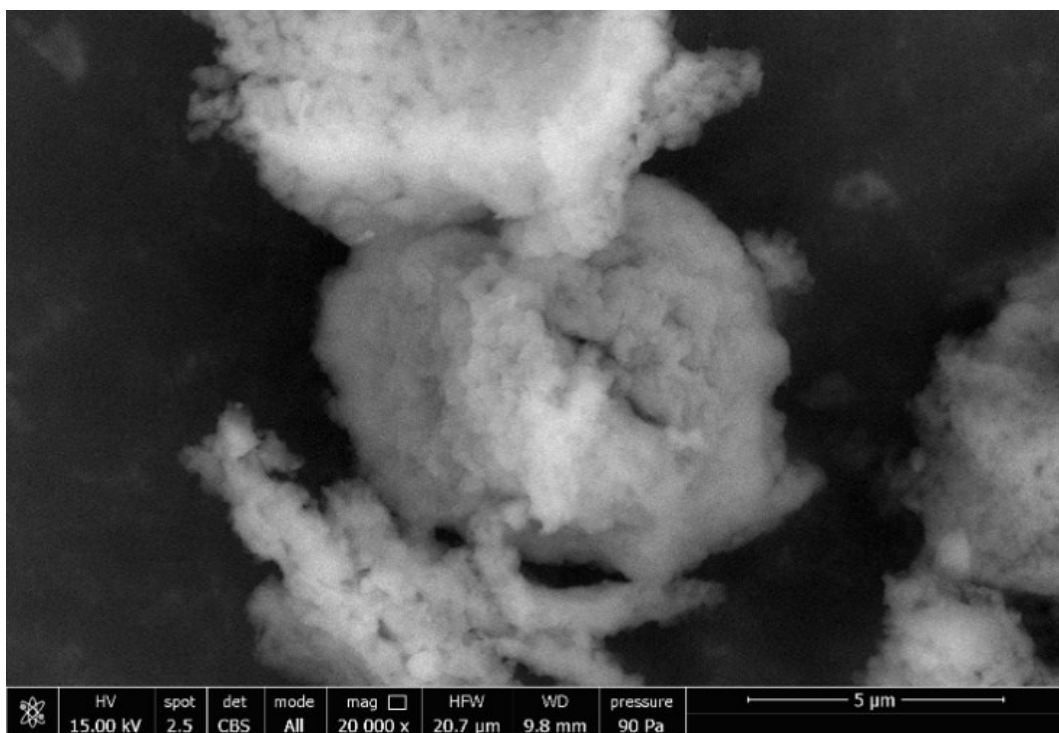


Figure S20 SEM micrograph of 3-chloropropyl-functionalized sporopollenin **CPS-SEC**



Figure S21 SEM micrograph of IL-functionalized sporopollenin **5a**

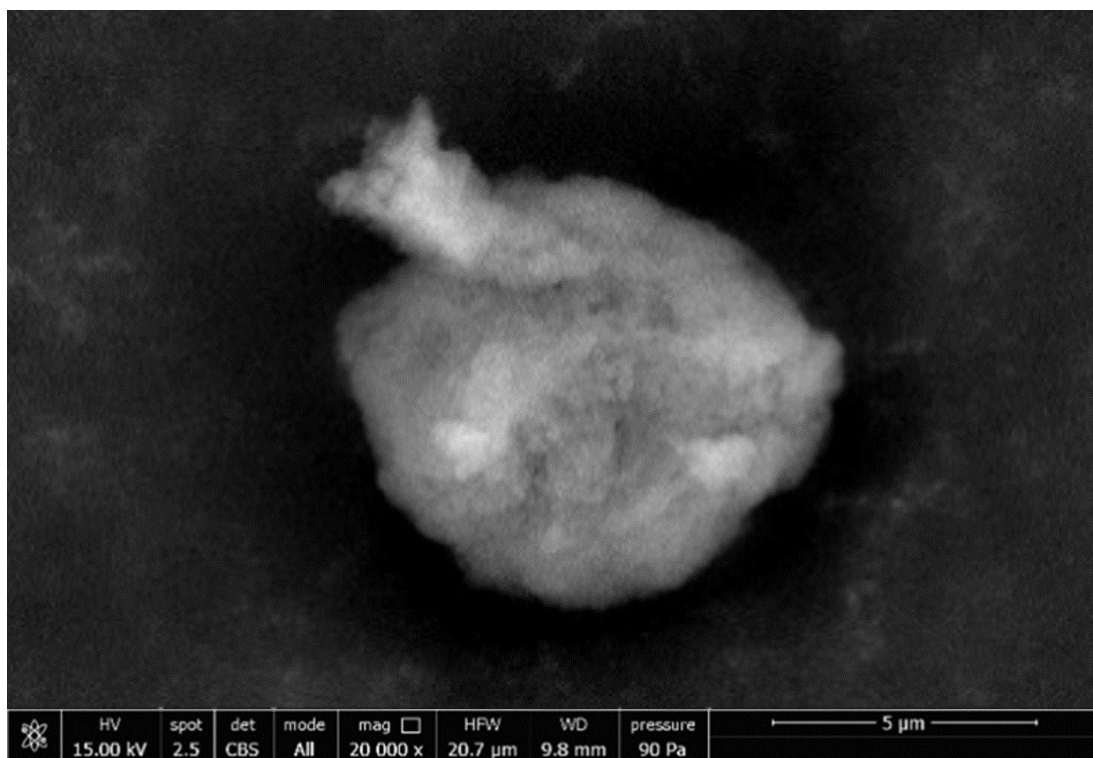


Figure S22 SEM micrograph of IL-functionalized sporopollenin **5b**

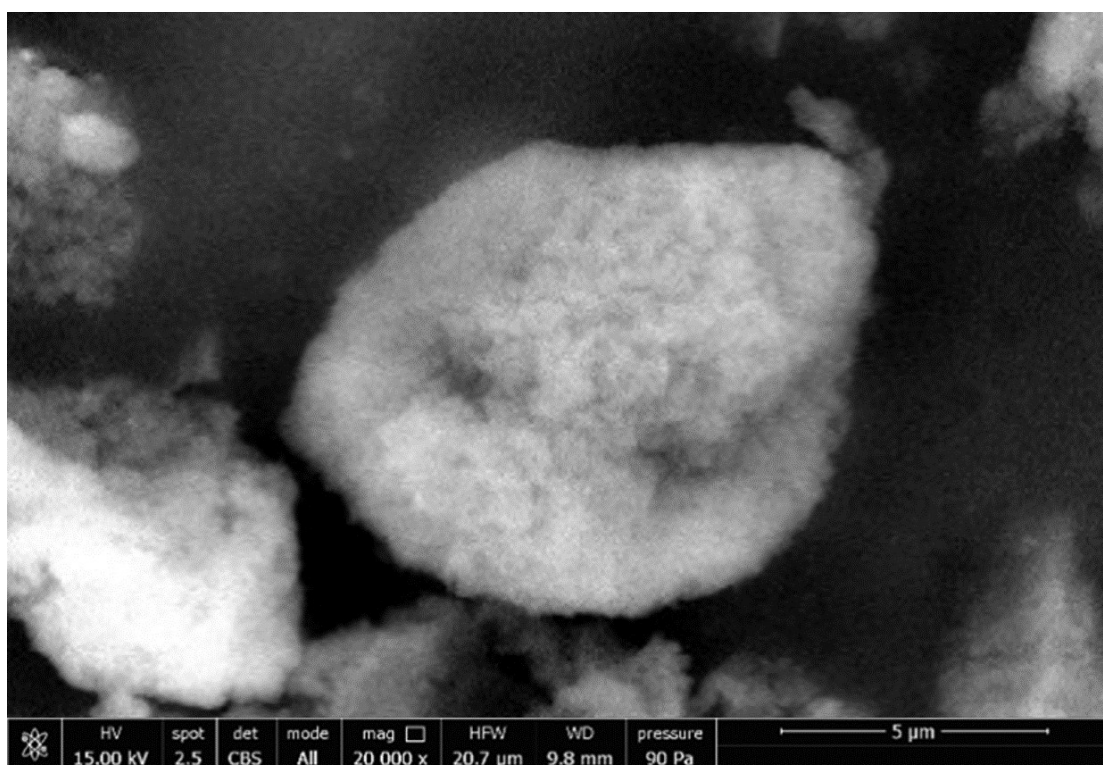


Figure S23 SEM micrograph of IL-functionalized sporopollenin **5c**

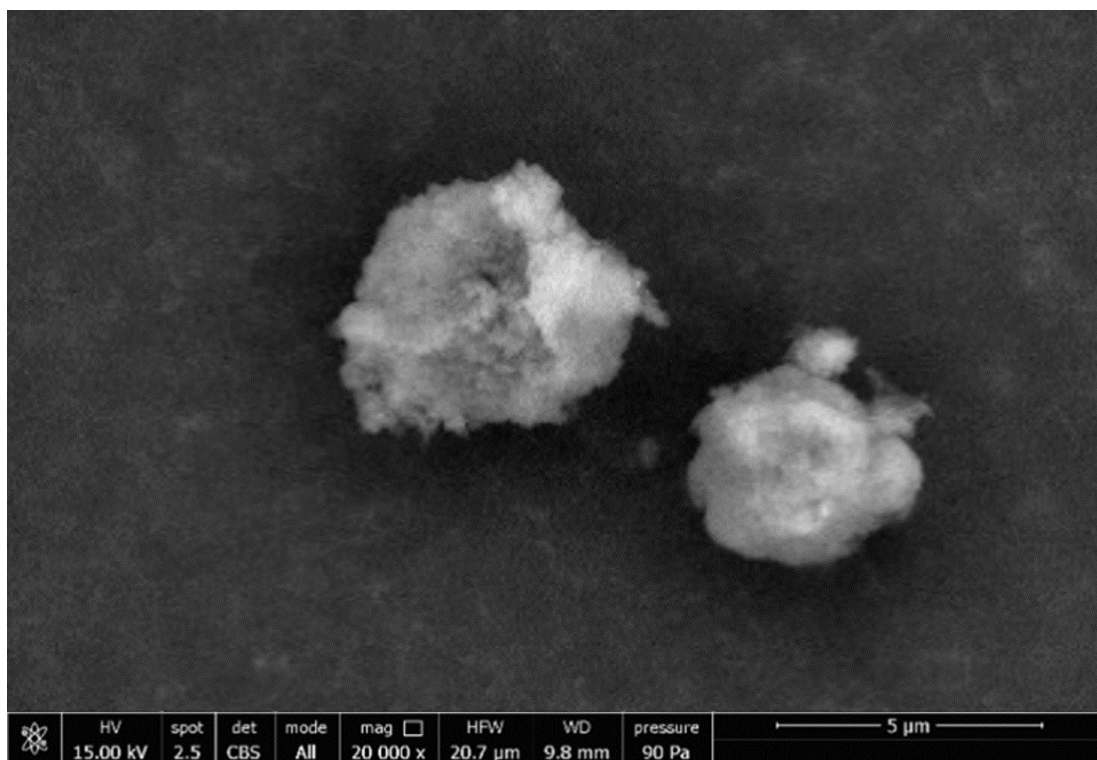


Figure S24 SEM micrograph of IL-functionalized sporopollenin **5d**