Electronic Supplementary Material (ESI) for Green Chemistry.

Supporting information for:

Sustainable functionalization of cellulose and starch with diallyl carbonate in ionic liquids

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1) IR-Spectra of modified cellulose and starch (including optimization studies)
2) NMR data of modified starch
3) NMR data of phosphorylated, modified cellulose and starch
4) GPC data of modified cellulose and starch
5) TGA data of modified cellulose and starch
6) Tensile strength measurements of modified cellulose
7) NMR data of recovered DAC and BMIMCl

1) IR-Spectra of modified cellulose and starch (including optimization studies)

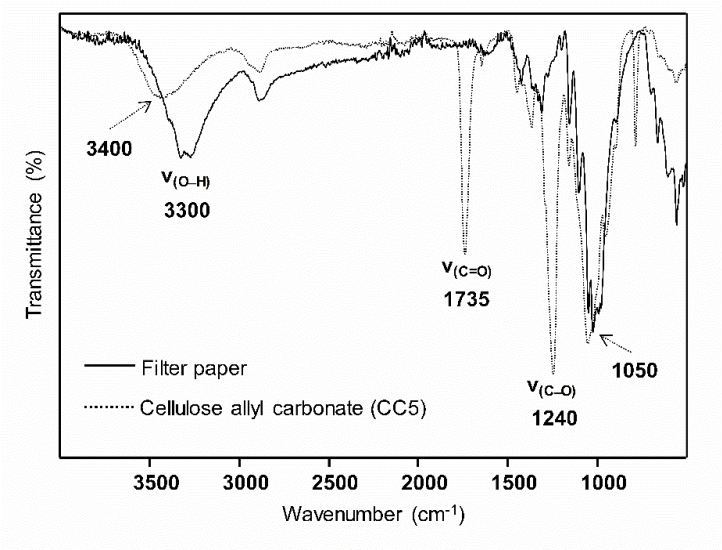


Fig. S1 ATR-IR spectra of filter paper and modified filter paper with diallyl carbonate (DAC) (DS: ~1.3) in BMIMCI/DMSO solvent mixture (18 h, 4 eq. DAC, 80 °C, 10% (w/w) DMSO & 2% (w/w) cellulose concentration). Spectra were normalized to the intensity of the glycopyranose oxygen absorption at around 1050 cm^{-1}.

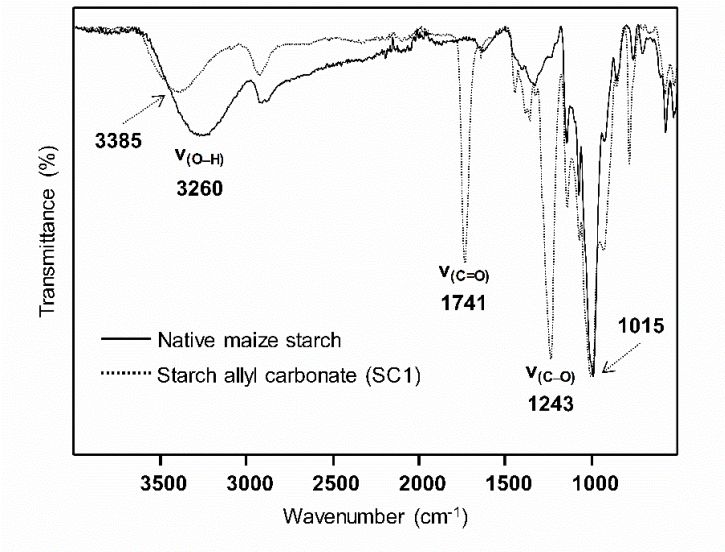


Fig. S2 ATR-IR spectra of maize starch and modified maize starch with DAC (DS: ~1.2) in BMIMCI/DMSO solvent mixture (18 h, 4 eq. DAC, 80 °C, 10% (w/w) DMSO & 2% (w/w) starch concentration). Spectra were normalized to the intensity of the glycopyranose oxygen absorption at around 1015 cm^{-1}.

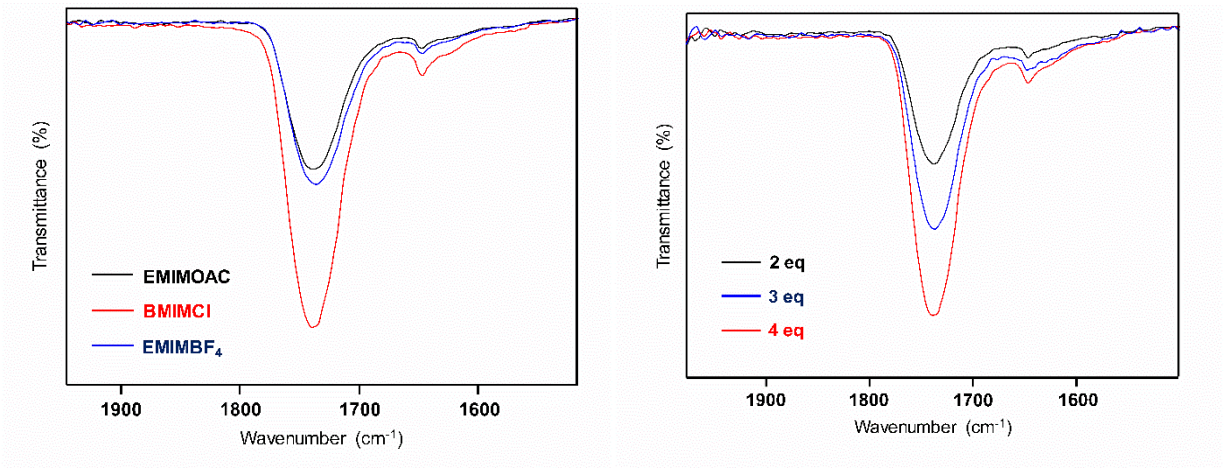


Fig. S3 ATR-IR spectra of carbonyl peak intensities (left) of modified filter paper with DAC in different ionic liquids, 1-butyl-3-methylimidazolium chloride (BMIMCl), 1-ethyl-3-methylimidazolium acetate (EMIMOAc) and 1-ethyl-3-methylimidazolium tetrafluoroborate ($EMIMBF_4$) (18 h, 3 eq. DAC, 80 °C, 10% (w/w) DMSO & 2% (w/w) cellulose concentration) and ATR-IR spectra of carbonyl peak intensities (right) of modified filter paper with different molar ratios of DAC in BMIMCl/DMSO solvent mixture (18 h, 80 °C, 10% (w/w) DMSO & 2% (w/w) cellulose concentration). Spectra were normalized with the intensity of the glycopyranose oxygen absorption at around 1050 cm^{-1}.

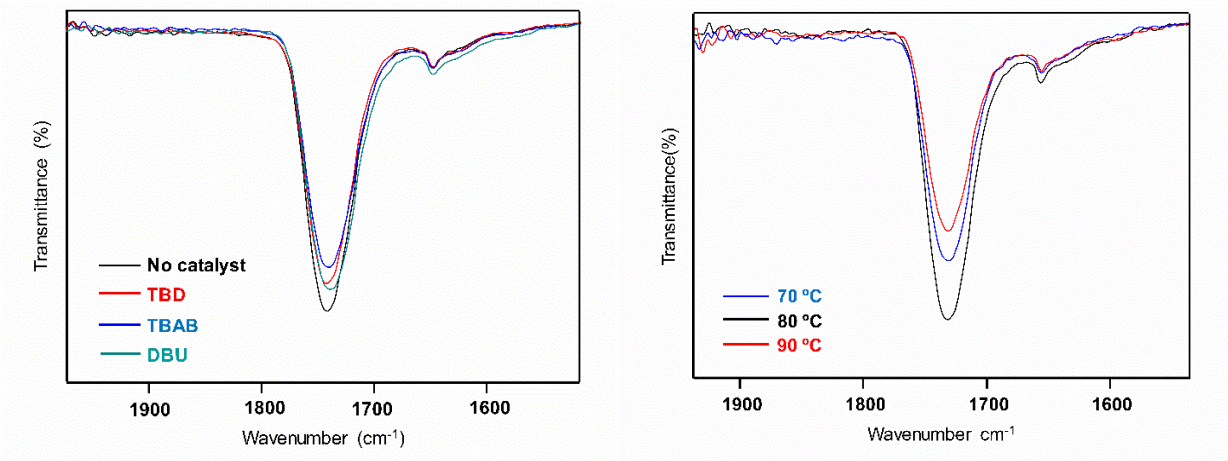


Fig. S4 ATR-IR spectra of carbonyl peak intensities (left) of modified filter paper with DAC in BMIMCl/DMSO solvent mixture using different catalysts (18 h, 4 eq. DAC, 80 °C, 10 mol% of catalyst, 10% (w/w) DMSO & 2% (w/w) cellulose concentration) and ATR-IR spectra of carbonyl peak intensities (right) of modified filter paper with DAC in BMIMCl/DMSO solvent mixture at different reaction temperatures (18 h, 4 eq. DAC, 10% (w/w) DMSO & 2% (w/w) cellulose concentration). Spectra were normalized to the intensity of the glycopyranose oxygen absorption at around 1050 cm^{-1}.

2) NMR data of modified starch

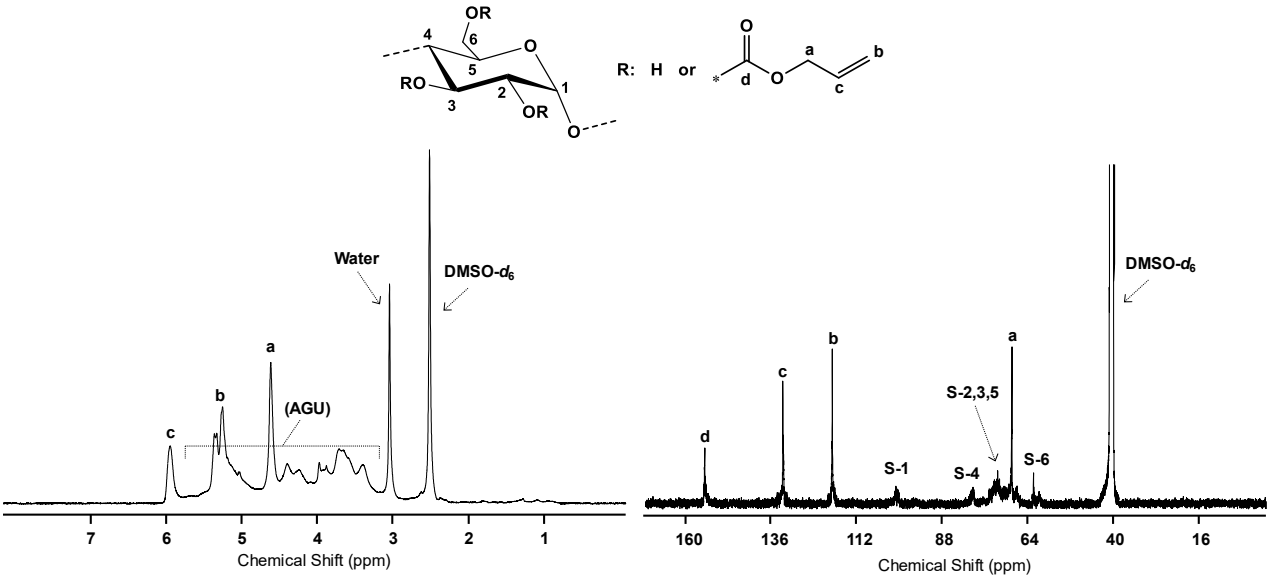


Fig. S5 ^{1}H NMR (left) and ^{13}C NMR (right) of modified starch with DAC.

3) NMR data of phosphorylated, modified cellulose and starch

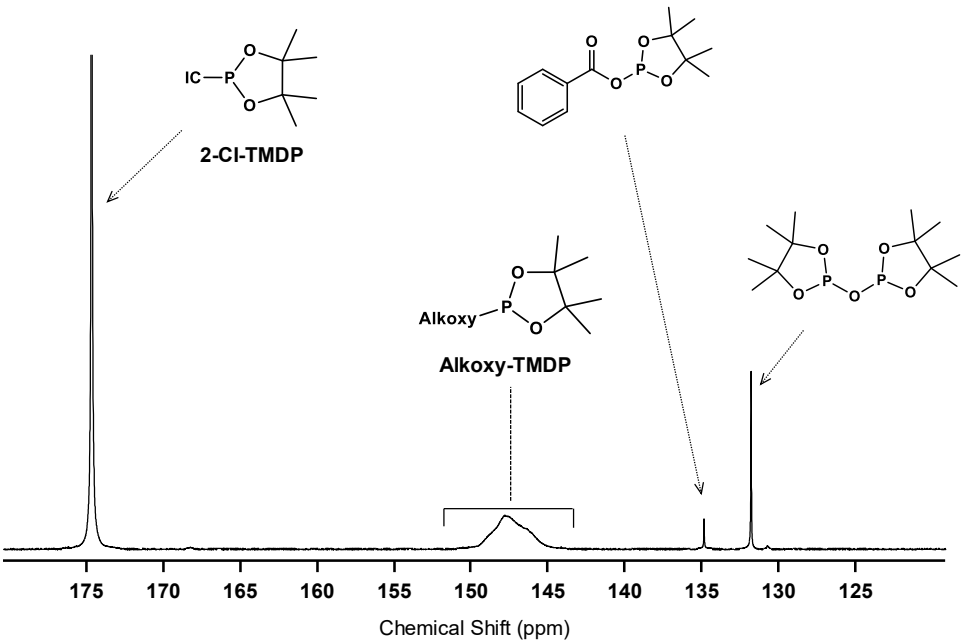


Fig. S6 ^{31}P NMR of modified filter paper with DAC.

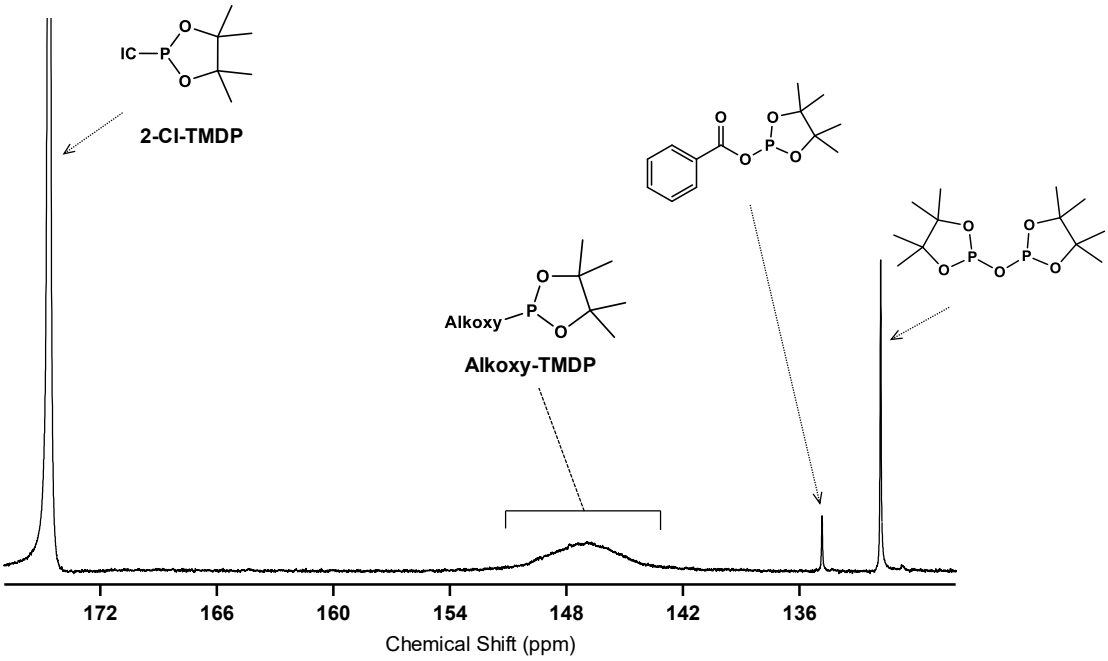
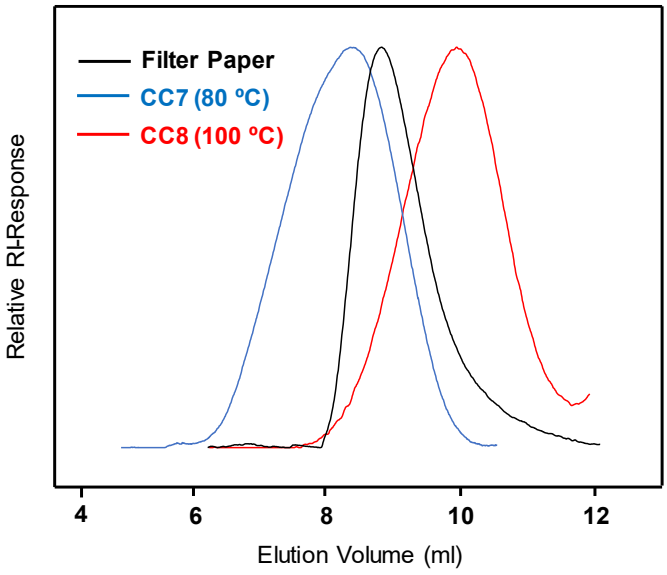


Fig. S7 ^{31}P NMR of modified maize starch with DAC.

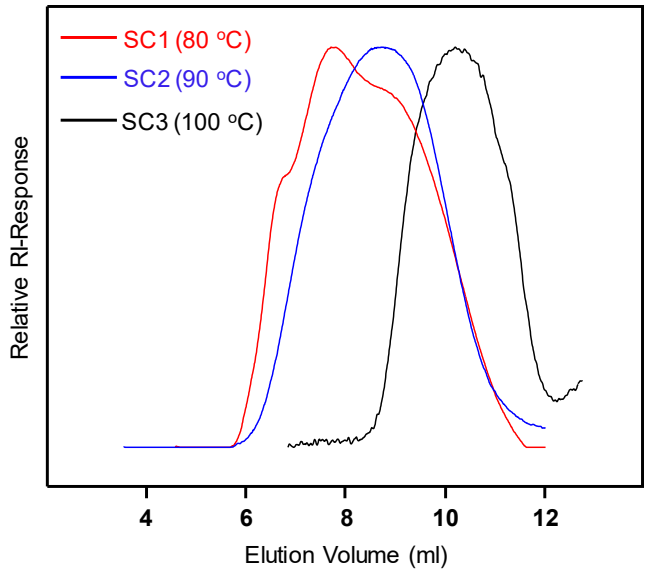
4) GPC data of modified cellulose and starch



Product[a]	M_w [kDa]	M_n [kDa][b]	$Đ$
Filter paper	78	40	1.93
CC7	349	82	4.20
CC8	67	15	4.32

[a]Reaction conditions: 18 h, 3eq. DAC, BIMIMCl/DMSO solvent mixture (10% (w/w) DMSO & 2% (w/w) cellulose concentration). [b]All GPC measurements were carried out relative to poly(methyl methacrylate) calibration in DMAc/LiBr (1% w/w)

Fig. S8 GPC data of unmodified filter paper and modified filter paper with DAC at different temperatures.



Product[a]	M_n [kDa][b]	M_w [kDa]	$Đ$
SC1	84	523	6.21
SC2	66	256	3.88
SC3	12	27	2.19

[a]Reaction conditions: 18 h, 3eq. DAC, BMIMCl/DMSO solvent mixture (10% (w/w) DMSO & 2% (w/w) starch concentration).
[b]All GPC measurements were carried out relative to poly(methyl methacrylate) calibration in DMAc/LiBr (1% w/w).

Fig. S9 GPC data of modified maize starch with DAC at different temperatures.

5) TGA data of modified cellulose and starch

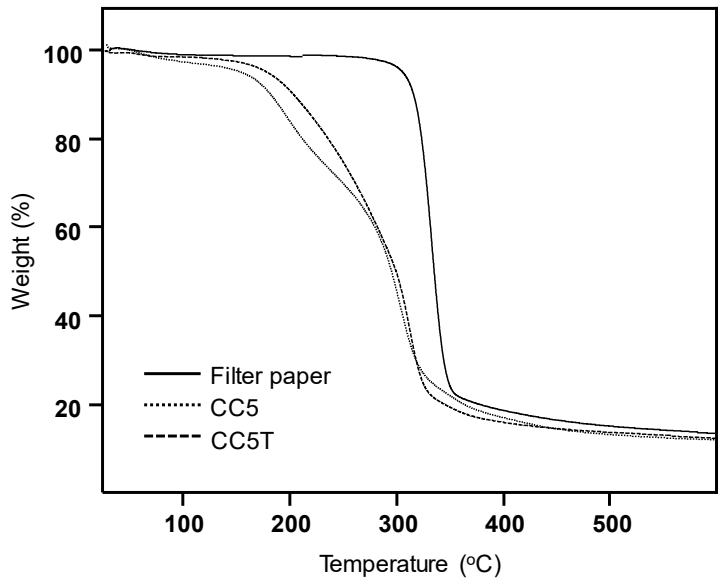


Fig. S10 TGA data of unmodified filter paper, modified filter paper with DAC (CC5) and thiol-ene product of cellulose allyl carbonate (CC5T).

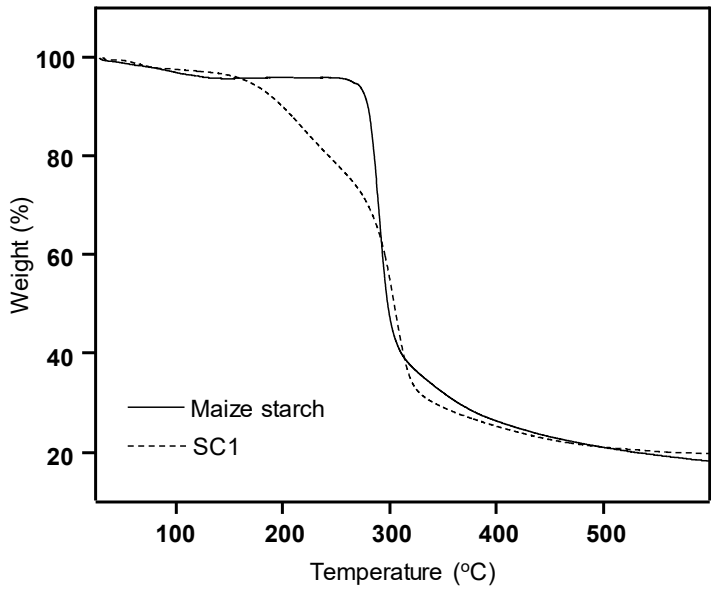


Fig. S11 TGA data of unmodified maize starch and modified maize starch with DAC.

6) Tensile strength measurement of modified cellulose

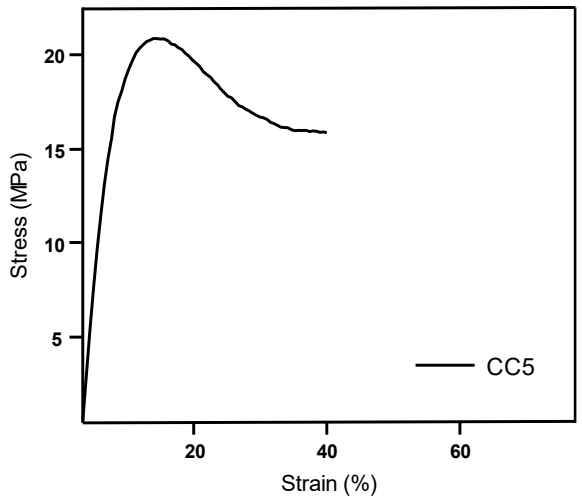


Fig. S12 Tensile strength measurement of modified filter paper with DAC (DS: ~1.3).

7) NMR data of recovered DAC and BMIMCl

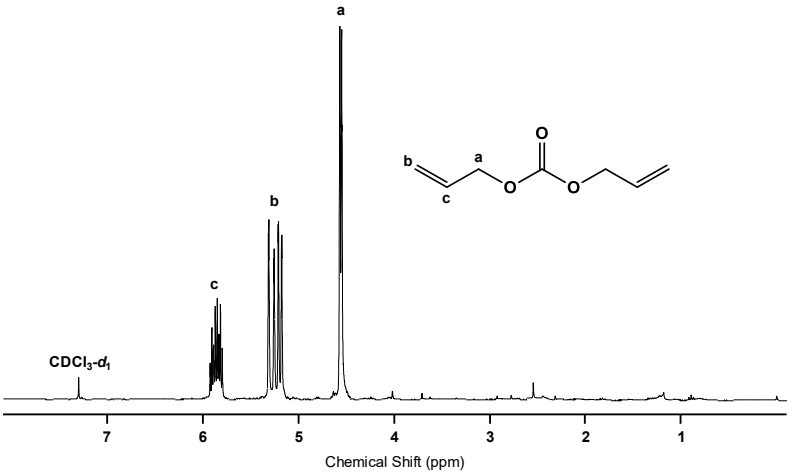


Fig. S13 ^{1}H NMR of recovered DAC.

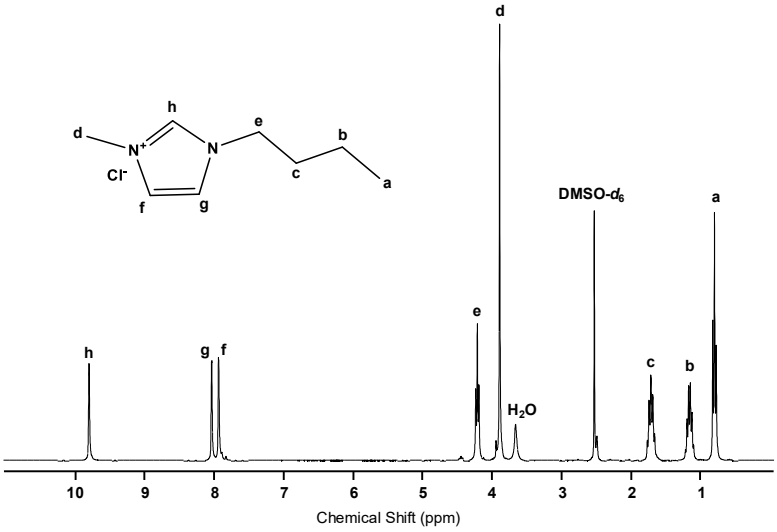


Fig. S14 ^{1}H NMR of recovered BMIMCl.