Electronic Supporting Information

Effects of polarity, hydrophobicity, and density of ionic liquids on cellulose solubility

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1. Stability of ionic liquids during cellulose dissolution process:

It is important to confirm that there is no structural changes of ILs during cellulose dissolution test. The structure of the ILs before and after dissolving cellulose was confirmed with both ¹H and ¹³C NMR measurements. ILs were found not to be decomposed during cellulose dissolving process.

As an example, NMR results for $[P_{5,5,5,5}][C_5CO_2]$ are described below:

Before cellulose dissolution

¹H NMR (400MHz, CDCl₃, 25 °C, Me₄Si) $\delta_{\rm H} = 0.855-0.927$ (m, 15H, P(CH₂)₄CH₃, CO₂(CH₂)₄CH₃), 1.285-1.401 (m, 12H, P(CH₂)₃CH₂, CO₂(CH₂)₂CH₂CH₂), 1.425-1.573 (m, 16H, PCH₂CH₂CH₂), 1.595-1.670 (m, 2H, CO₂CH₂CH₂), 2.169 (t, J = 16.03, 2H, CO₂CH₂), 2.409-2.482 (m, 8H, PCH₂).

¹³C-NMR (100MHz; CDCl₃, 25 °C, Me₄Si) $\delta_{\rm C}$ = 13.84, 14.28, 18.93 (d, *J* = 46.96), 21.74 (d, *J* = 4.79), 22.18, 22.87, 27.18, 32.52, 32.99 (d, *J* = 15.34), 39.59, 179.59.

After cellulose dissolution

¹H NMR (400MHz, CDCl₃, 25 °C, Me₄Si) $\delta_{\rm H} = 0.871-0.953$ (m, 15H, P(CH₂)₄CH₃, CO₂(CH₂)₄CH₃), 1.304-1.392 (m, 12H, P(CH₂)₃CH₂, CO₂(CH₂)₂CH₂CH₂), 1.431-1.565 (m, 16H, PCH₂CH₂CH₂), 1.610-1.657 (m, 2H, CO₂CH₂CH₂), 2.173 (t, *J* = 16.04, 2H, CO₂CH₂), 2.412-2.472 (m, 8H, PCH₂).

¹³C-NMR (100MHz; CDCl₃, 25 °C, Me₄Si) $\delta_{\rm C}$ = 13.83, 14.21, 18.93 (d, *J* = 46.96), 21.75 (d, *J* = 4.79), 22.18, 22.87, 27.11, 32.49, 32.96 (d, *J* = 15.34), 39.46, 179.51.