Supporting Information

CO_2 as viscosity index improver for wind turbine oils

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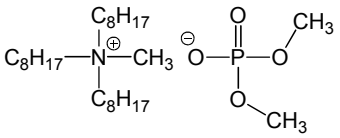
Characterization of Ionic Liquids

NMR spectra were measured with a JEOL ECX + 400 spectrometer (^{1}H: 400 MHz, ^{13}C: 100 MHz, ^{31}P: 162 MHz). In all experiments $CDCl_3$ was chosen as internal standard. In the following listed data the chemical shifts are given in parts per million (ppm) and the coupling constants in Hz.

Trioctylmethylammonium dimethyl phosphate [OMA][DMP] (yellow liquid)

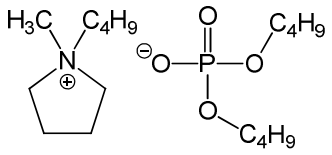


^{1}H-NMR (400MHz, $CDCl_3$, [ppm]) δ = 0.80 (9H, t, N-C_7H_{14}-CH_3, $^{3}J^{(H,H)}$ = 6.0 Hz), 1.10 – 1.40 (30H, m, N-C_2H_4-C_5H_{10}-CH_3), 1.50 – 1.68 (6H, m, N-CH_2-CH_2-C_6H_{13}), 3.22 (3H, s, N-CH_3), 3.28 – 3.40 (6H, m, N-CH_2-C_7H_{15}), 3.51 (6H, d, PO-CH_3, $^{3}J^{(H,P)}$ = 9.6 Hz).

^{13}C-NMR (100MHz, $CDCl_3$, [ppm]) δ = 12.76 (N-C_7H_{14}-CH_3), 21.17 (N-C_6H_{12}-CH_2-CH_3), 21.30 (N-CH_2-CH_2-C_6H_{13}), 25.10 (N-C_2H_4-CH_2-C_5H_{11}), 27.78 (N-C_3H_6-CH_2-C_4H_9), 27.89 (N-C_4H_8-CH_2-C_3H_7), 30.38 (N-C_5H_{10}-CH_2-C_2H_5), 47.45 (N-CH_3), 51.07 (d, PO-CH_3), 60.02 (N-CH_2-C_7H_{15}).

^{31}P-NMR (162MHz, $CDCl_3$, [ppm]) δ = 3.05 ($PO_4(CH_3)_2$).

1,1-Butylmethylpyrrolidinium dibutyl phosphate [BMPyrr][DBP] (yellow liquid)

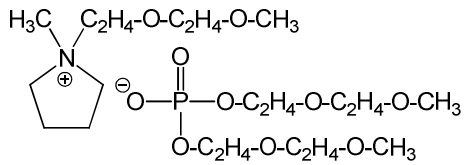


^{1}H-NMR (400MHz, $CDCl_3$, [ppm]) δ = 0.60 – 1.00 (9H, m, -C_3H_6-*CH_3*), 1.16 – 1.40 (6H, m, -C_2H_4-*CH_2*-CH_3), 1.43 – 1.58 (4H, m, P-O-CH_2-*CH_2*-C_2H_5), 1.61 – 1.70 (2H, m, N^+-CH_2-*CH_2*-C_2H_5), 2.00 – 2.20 (4H, m, N^+-CH_2-*C_2H_5*-CH_2), 3.19 (3H, s, N^+-*CH_3*), 3.45 – 3.54 (2H, m, N^+-*CH_2*-C_3H_7), 3.55 – 3.87 (8H, m, P-O-*CH_2*-C_3H_7 + N^+-*CH_2*-C_2H_5-*CH_2*).

^{13}C-NMR (100MHz, $CDCl_3$, [ppm]) δ = 13.91 (-C_3H_6-*CH_3*), 19.31 (P-O-C_2H_4-*CH_2*-CH_3), 19.84 (N^+-C_2H_4-*CH_2*-CH_3), 21.71 (N^+-CH_2-*C_2H_5*-CH_2), 25.96 (N^+-CH_2-*CH_2*-C_2H_5), 33.09 (P-O-CH_2-*CH_2*-C_2H_5), 48.37 (N^+-*CH_3*), 63.54 (N^+-*CH_2*-C_3H_7), 64.07 (N^+-*CH_2*-C_2H_5-*CH_2*), 64.83 (P-O-*CH_2*-C_3H_7).

^{31}P-NMR (162MHz, $CDCl_3$, [ppm]) δ = 0.73 (*P*$O_4(C_4H_9)_2$).

1-(2-(2-methoxyethoxy)ethoxy)-1-methylpyrrolidin-1-ium bis(2-(2-methoxy-ethoxy)ethyl) phosphate [MEG$_2$MPyrr][B(MEG$_2$)P] (yellow liquid)



^{1}H-NMR (400MHz, $CDCl_3$, [ppm]) δ = 2.09 – 2.34 (4H, m, N^+–CH_2-*CH_2*–*CH_2*-CH_2-), 3.10 (3H, s, N^+-CH_3), 3.30 (9H, s, -C_2H_4-O-C_2H_4-O-*CH_3*), 3.47 – 3.53 (6H, m, -C_2H_4-O-CH_2-*CH_2*-O-CH_3), 3.59 – 3.73 (12H, m, -CH_2-*CH_2*-O-*CH_2*-CH_2-O-CH_3), 3.76 – 3.88 (2H, m, N^+-*CH_2*-CH_2-O-), 3.91 – 4.10 (8H, m, P-O-*CH_2*-CH_2-O- + N^+–*CH_2*-CH_2–CH_2-*CH_2*).

^{13}C-NMR (100MHz, $CDCl_3$, [ppm]) δ = 21.53 (N^+–CH_2-*CH_2*–*CH_2*-CH_2-), 48.72 (N^+-CH_3), 58.93 (-C_2H_4-O-C_2H_4-O-*CH_3*), 64.40 (P-O-*CH_2*-CH_2-O-), 65.39 (N^+–*CH_2*-CH_2–CH_2-*CH_2*), 65.60 (N^+-*CH_2*-CH_2-O-), 70.26 (-CH_2-CH_2-O-*CH_2*-CH_2-O-CH_3), 71.10 (P-O-CH_2-*CH_2*-O-), 71.60 (N^+-CH_2-*CH_2*-O-), 72.01 (-C_2H_4-O-CH_2-*CH_2*-O-CH_3).

^{31}P-NMR (162MHz, $CDCl_3$, [ppm]) δ = 0.49 (*P*O_4).