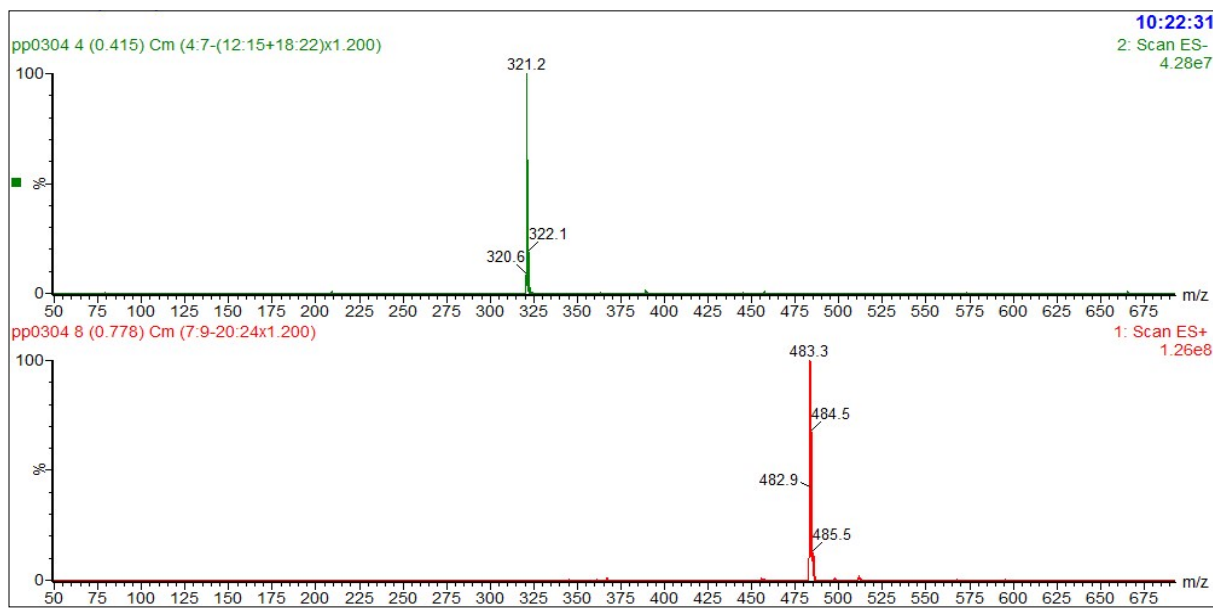


Supplementary information

1. Mass spectroscopy

P₆₆₆₁₄ BEHP: ES⁺, 483.3 { [C₆H₁₃]₃ C₁₄H₂₉P⁺ }; ES⁻ 321.2 , { [C₈H₁₇O]₂ OPO⁻ }



2. NMR Characterization

Neat Ionic Liquids:

¹H NMR(CDCl₃) of Neat ILs are mentioned below:

P₆₆₆₁₄ BEHP

The ¹H NMR of P₆₆₆₁₄BEHP is:

¹H NMR δ_H (400 MHz, CDCl₃, ppm relative to TMS): 3.70 (m, 4H), 2.40 (m,8H), 1.52-1.21 (m,66H), 0.857(m,24H)

P₆₆₆₁₄ TMP

¹H NMR δ_H (400 MHz, CDCl₃, ppm relative to TMS): 2.55–2.49 (m, 8H), 2.03–1.98 (m, 4H), 1.57–1.12 (m, 62H), 0.93–0.84 (m, 30H)

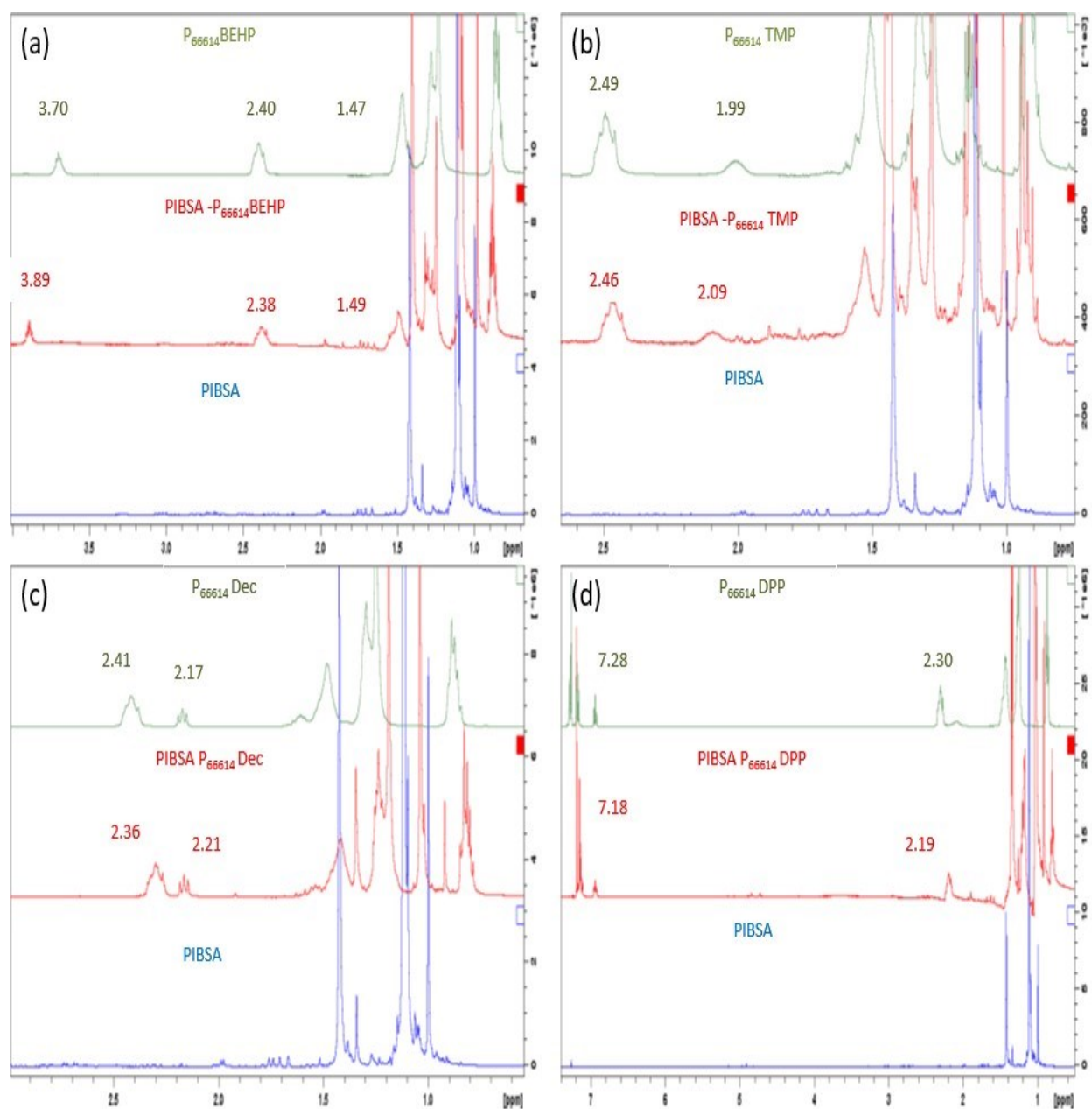
P₆₆₆₁₄ Dec

¹H NMR δ_H (400 MHz, CDCl₃, ppm relative to TMS): 0.85-0.91 (m,8H), 1.22-1.31(m, 40 H),1.64 (m, 18H),1.85 (m,1H),2.15(m, 2H) , 2.41 (m, 8H)

P₆₆₆₁₄ DPP

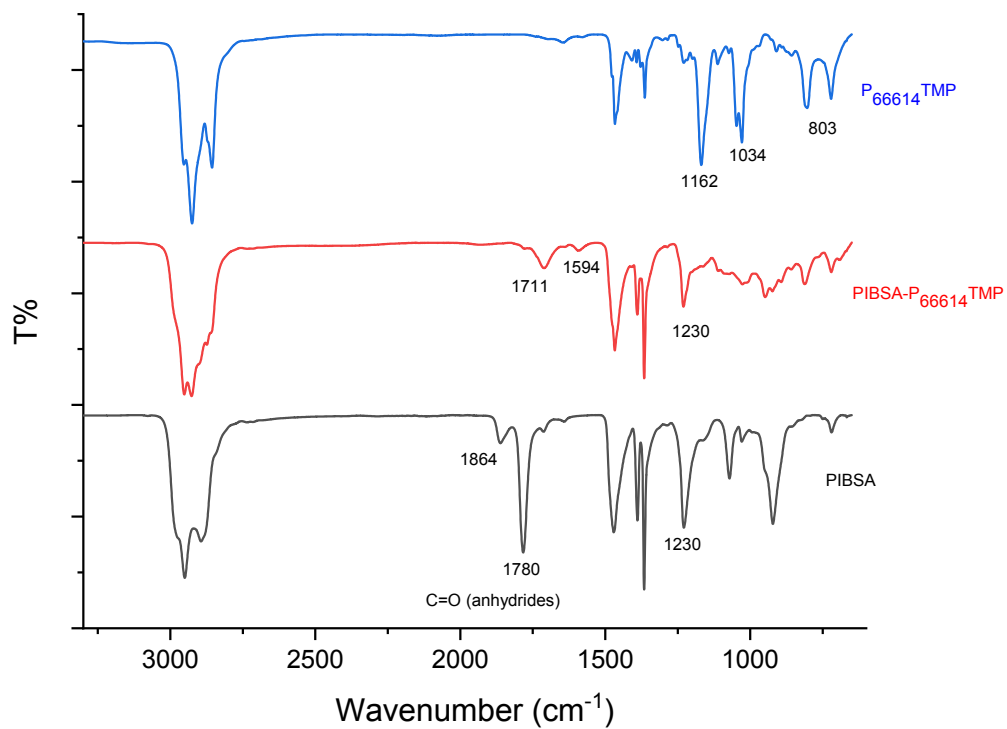
¹H NMR δ_H (400 MHz, CDCl₃, ppm relative to TMS): 7.29–7.27 (m, 4H), 7.20–7.16 (m, 4H), 6.96–6.92 (m, 2H), 2.30–2.22 (m, 8H), 1.45–1.24 (m, 24H), 0.90–0.83 (m, 12H).

PIBSA/Ionic Liquid Blends:

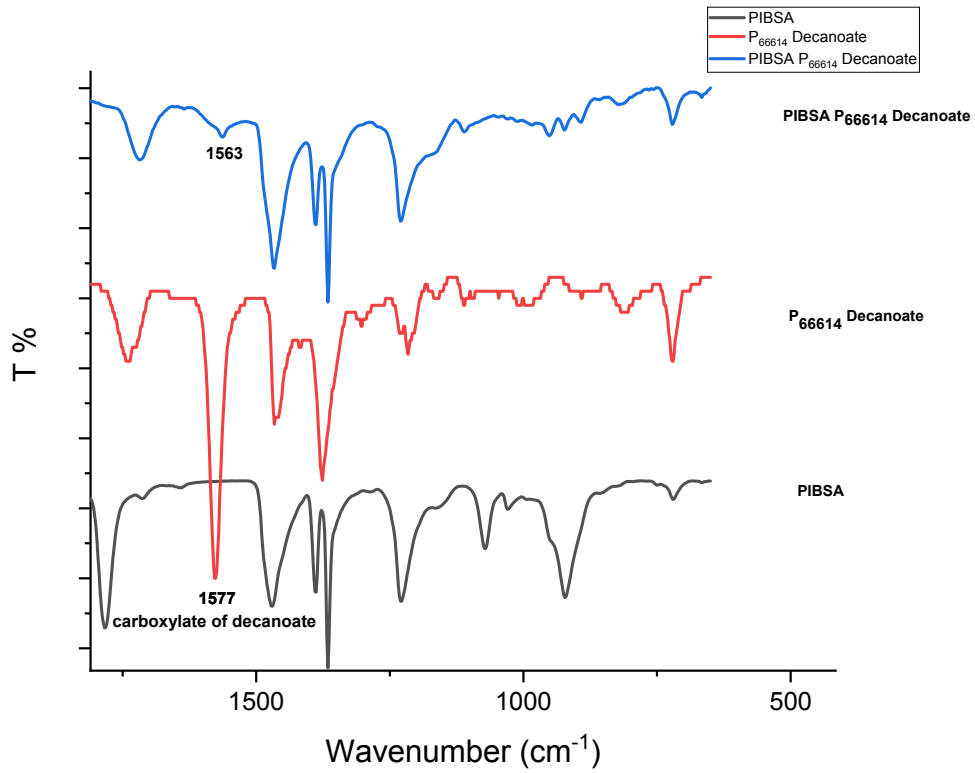


S11: ¹H NMR of PIBSA, P₆₆₆₁₄ anion, PIBSA/P₆₆₆₁₄ anion which shows shifting of peaks which shows weak interaction between the two

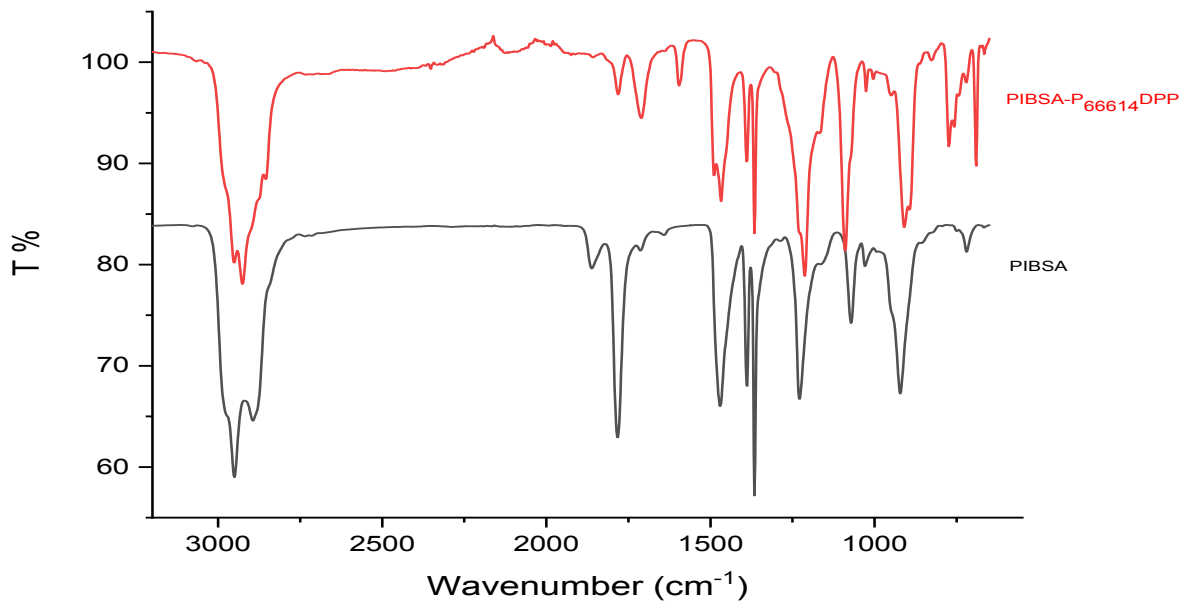
3. IR characterizations:



SI 2 IR spectra of IR spectra of (a) PIBSA (black) (b) PIBSA-P₆₆₆₁₄ TMP (Red) (c) P₆₆₆₁₄ TMP (blue)

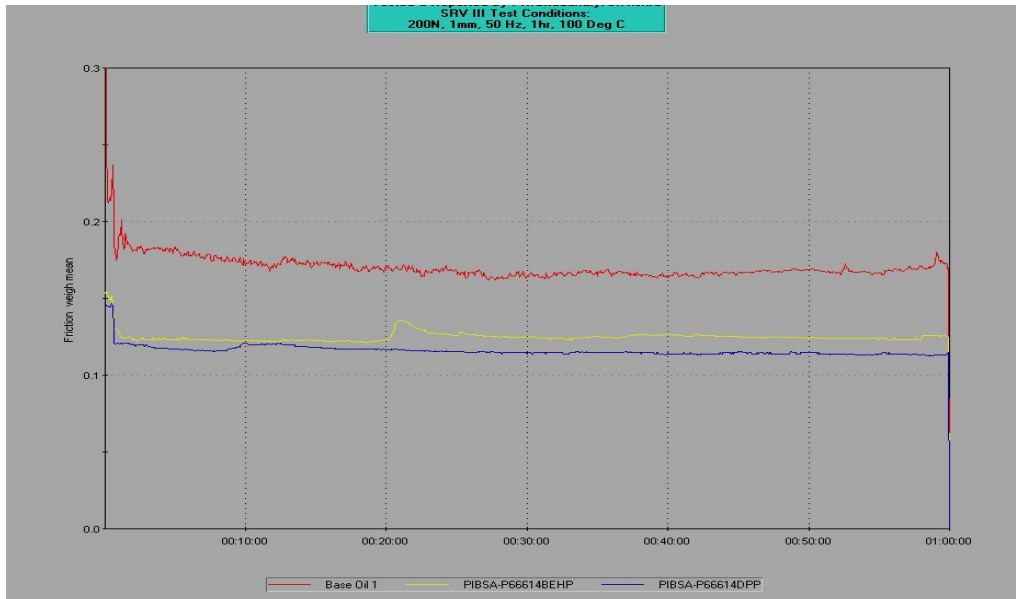


SI 3 IR spectra of (a) PIBSA (black) (b) PIBSA-P₆₆₆₁₄ Dec (Red) (c) P₆₆₆₁₄ Dec (blue)



SI4 IR spectra of (a) PIBSA (black) (b) PIBSA-P₆₆₆₁₄ DPP (blue)

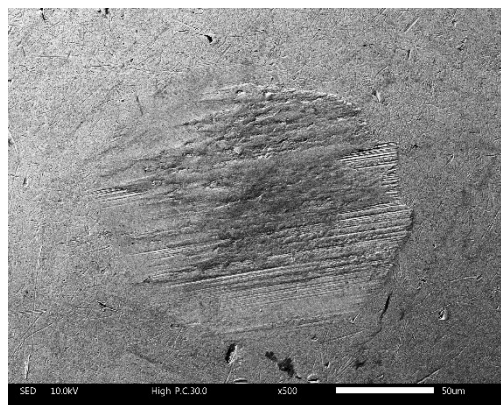
4. SRV test



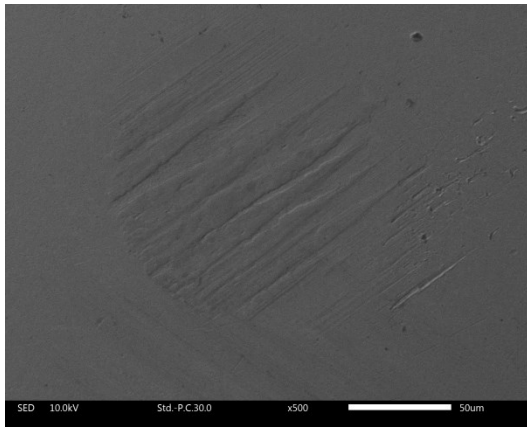
SI 5: SRV test at 200N, 1mm surface, 50Hz, 100 °C for duration of 1 hrs by comparing of COF of

(a) Base oil (red) (b) PIBSA-P₆₆₆₁₄BEHP (yellow) (c) PIBSA P₆₆₆₁₄ DPP (blue)

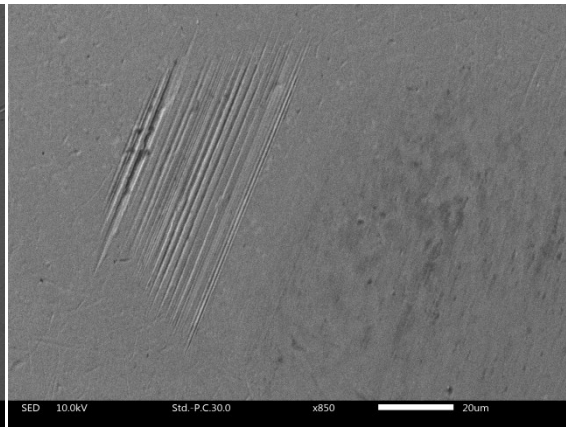
5. SEM Images



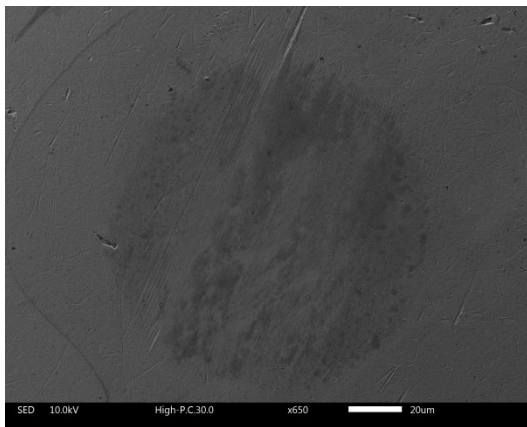
Base oil -15N, 200mm/min



PIBSA-P₆₆₆₁₄ Dec , 15N, 200mm/min



PIBSA-P₆₆₆₁₄ DPP, 15N, 200mm/min



PIBSA-P66614 BMLB, 15N, 200mm/min



PIBSA-P66614 TMP, 15N, 200mm/min

SI6: SEM Images of PIBSA blend ILs