

SUPPLEMENTARY MATERIALS

Optimization and kinetic studies on biodiesel conversion from *Chlorella vulgaris* microalgae using pyrrolidinium-based ionic liquids as catalyst

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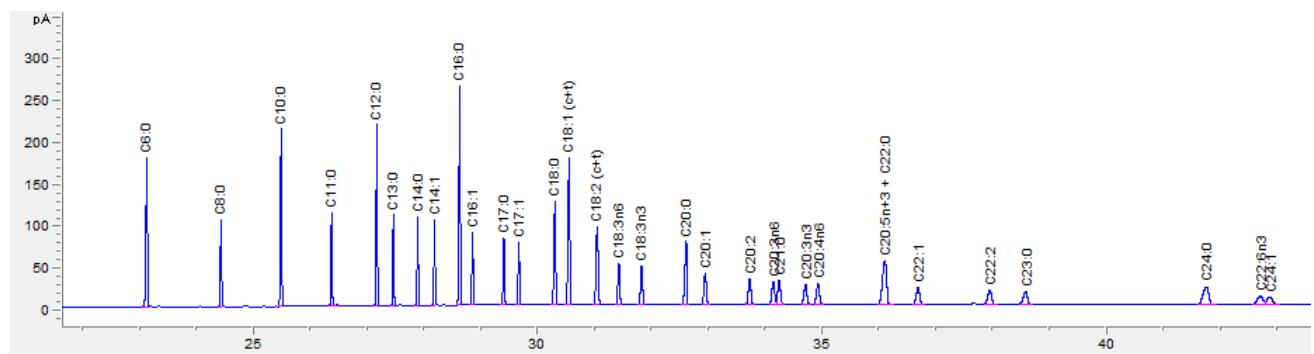
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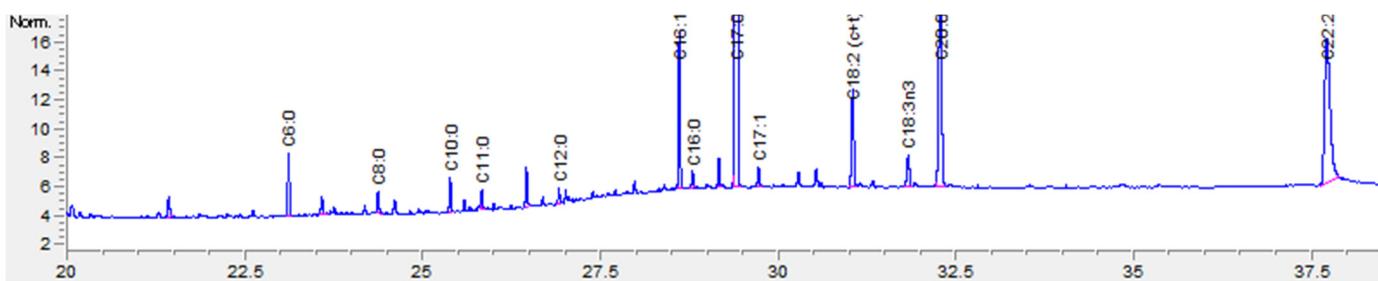
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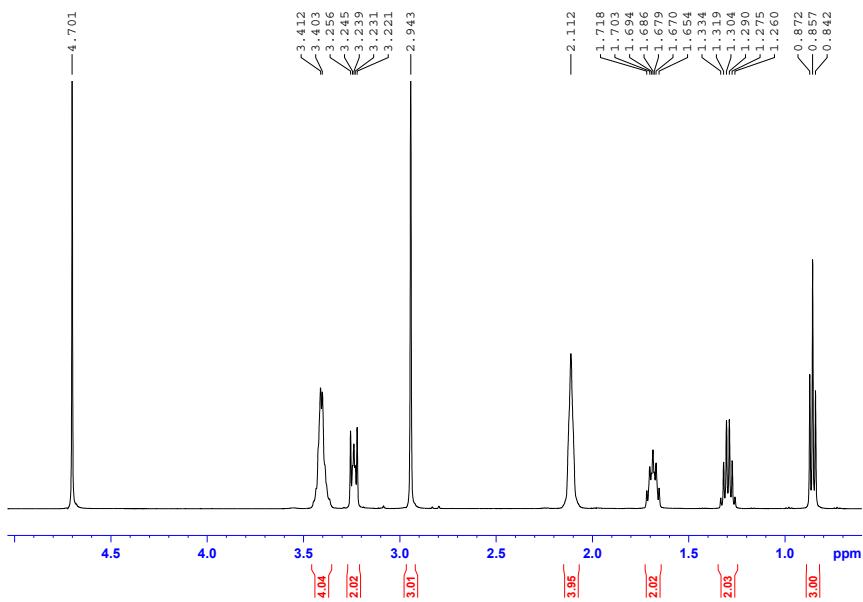
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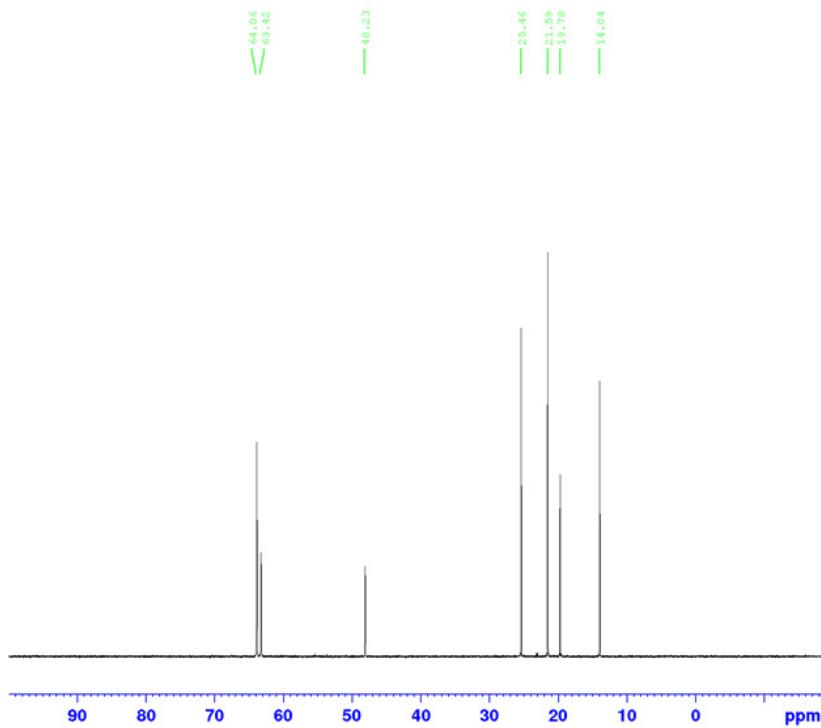
Supplementary Figure S1: Chromatogram of the 37 Component FAME mix obtained using GC-FID equipment with a DB-Wax column.



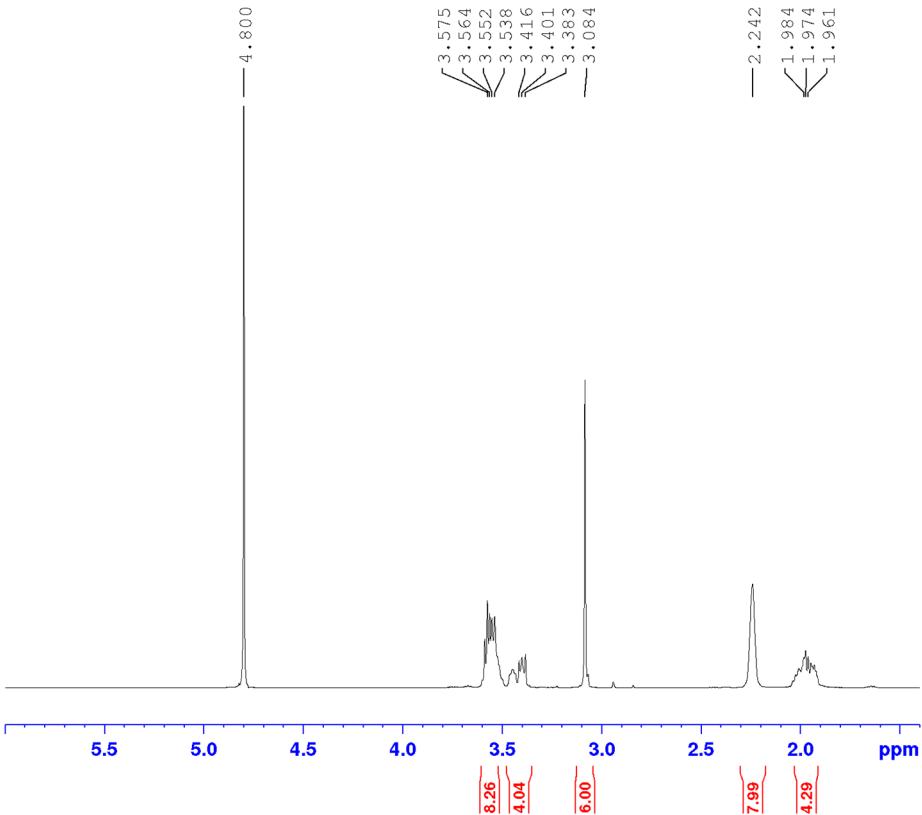
Supplementary Figure S2: GC chromatogram for the characterization of the FAME sample (IL 1) at 60°C, 20 min, in 30 mL of MeOH and 3.0% wt of IL.



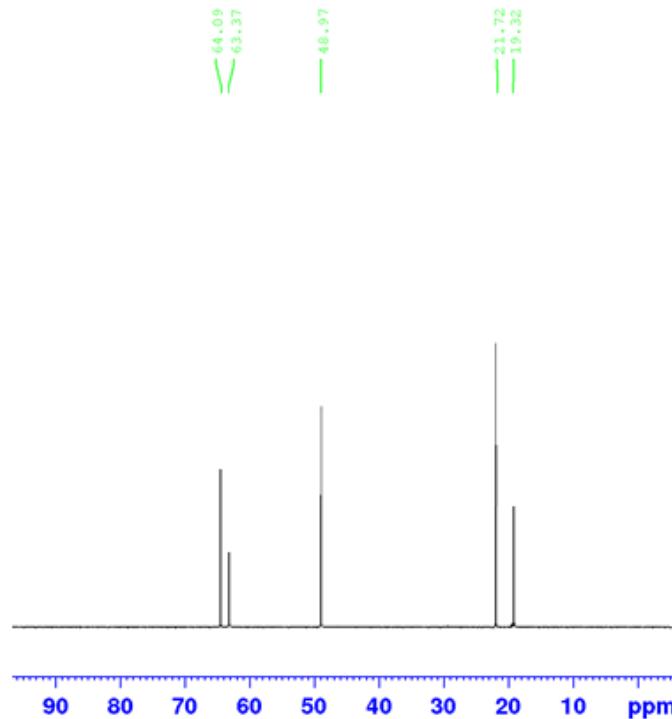
Supplementary Figure S3: ^1H NMR of IL 1: ^1H NMR (500 MHz, D_2O) $\delta = ^1\text{H}$ NMR (500 MHz, D_2O): δ 3.40-3.37 (m, 4H), 3.23-3.19 (m, 2H), 2.92 (s, 3H), 2.09 (m, 4H), 1.69-1.62 (m, 2H), 1.31-1.23 (m, 2H), 0.83 (t, 3H, $J = 7.5$ Hz).



Supplementary Figure S4: ^{13}C NMR of IL 1: ^{13}C NMR (125 MHz, D_2O): $\delta = ^{13}\text{C}$ NMR (125 MHz, D_2O): δ 14.04, 19.78, 21.59, 25.46, 48.23, 63.42, 64.06.



Supplementary Figure S5: ¹H NMR of IL 2: ¹H NMR (500 MHz, D₂O): δ 3.58-3.38 (m, 12H), 3.08 (s, 6 H), 2.24 (m, 8H), 1.98-1.96 (m, 4 H).



Supplementary Figure S6: ¹³C NMR of IL 2: ¹³C NMR (125 MHz, D₂O): δ = 19.32, 21.72, 48.97, 63.37, 64.09.