New organic ionic plastic crystals utilizing the morpholinium cation

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Supplementary Information

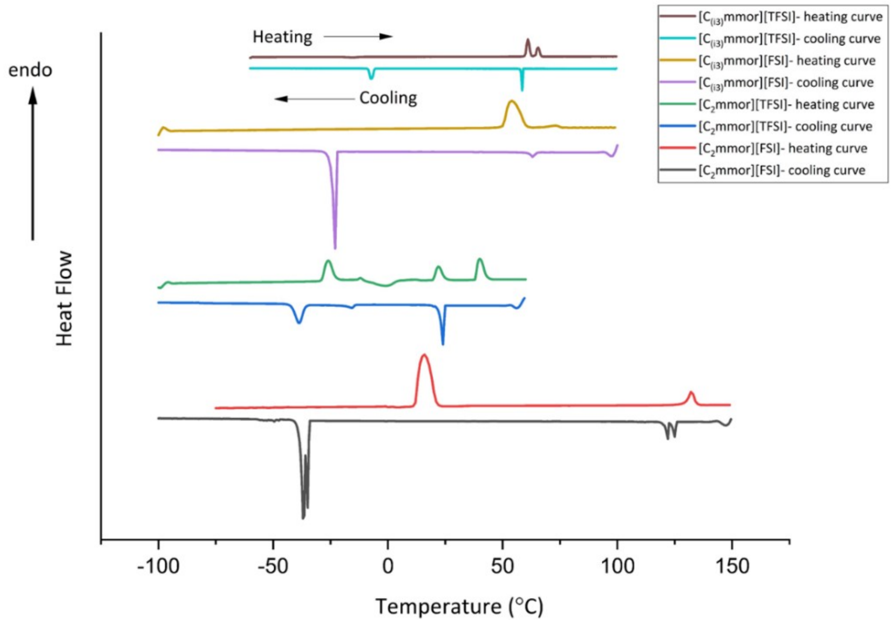

Figure S1: DSC traces of all four morpholinium -based salts. Heating and cooling curves were obtained from the second cycle. For [C_2mmor][FSI], [C_2mmor][TFSI] and [$C_{(i3)}$mmor][FSI] the scan rate was 10 °C min^{-1}. For [$C_{(i3)}$mmor][TFSI] scan rate was 2 °C min^{-1}

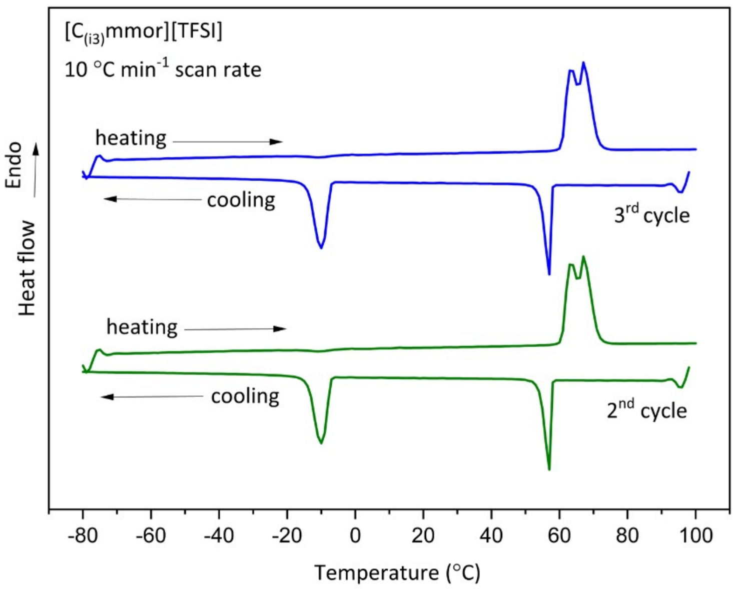

Figure S2: DSC thermogram of the [$C_{(i3)}$mmor][TFSI] salt, scan rate 10 °C min^{-1}. 2nd heating and cooling curves are shown in green. 3rd heating and cooling curves are shown in red, respectively.

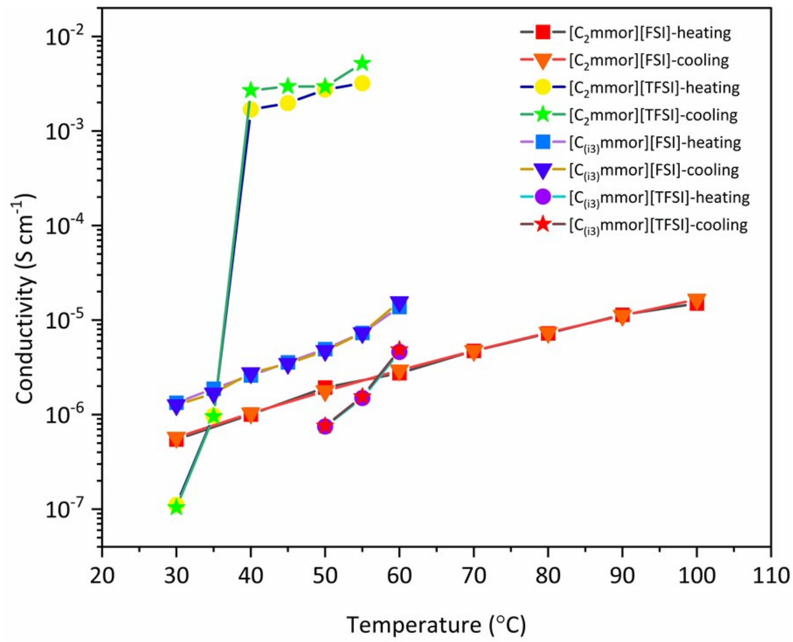

Figure S3: The combined heating and cooling ionic conductivity values of the morpholinium salts

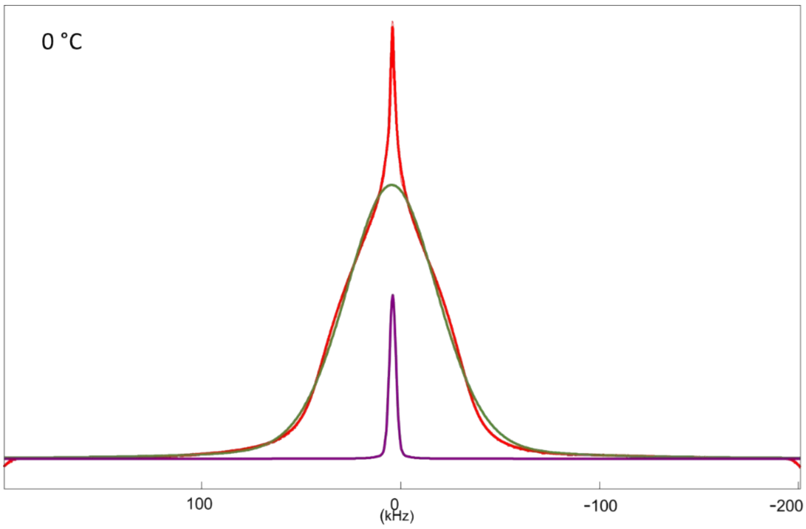

Figure S4: Solid-state NMR deconvolution fitting using DMfit software of [C_2mmor][FSI] at 0 °C. The green peak represents broad component, and the purple peak represents the narrow component. The red peak is the cumulative peak.

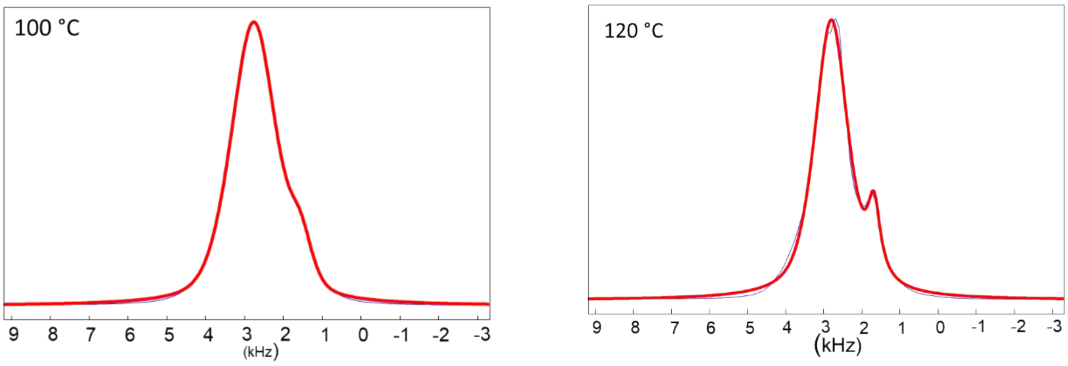

Figure S5 : For [C_2mmor][FSI] in Phase I, a small proportion of more dynamic cations start growing at higher temperatures. The peak becomes distinguishable from 100 °C onwards. This could be due to two different proton environments in the cationic structure that get resolved when the temperature is increased.

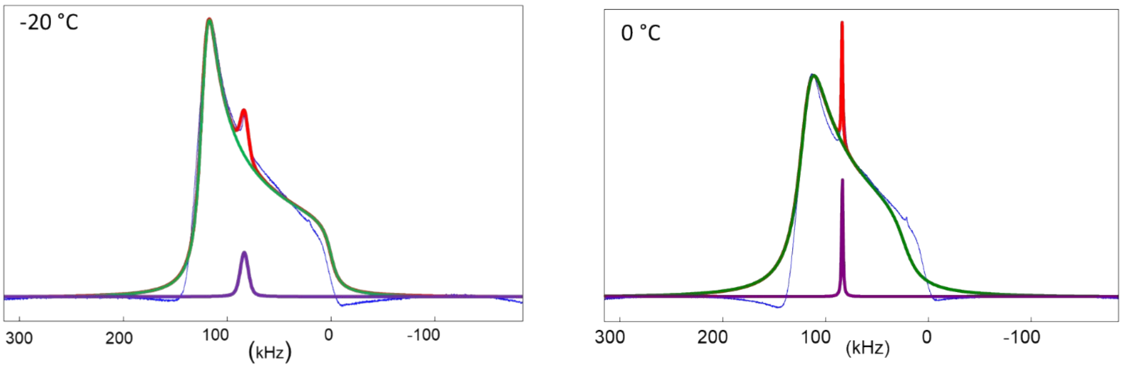

Figure S6: The deconvolution of the broad asymmetric peaks of [C_2mmor][FSI] considering CSA parameters at -20 °C and 0 °C

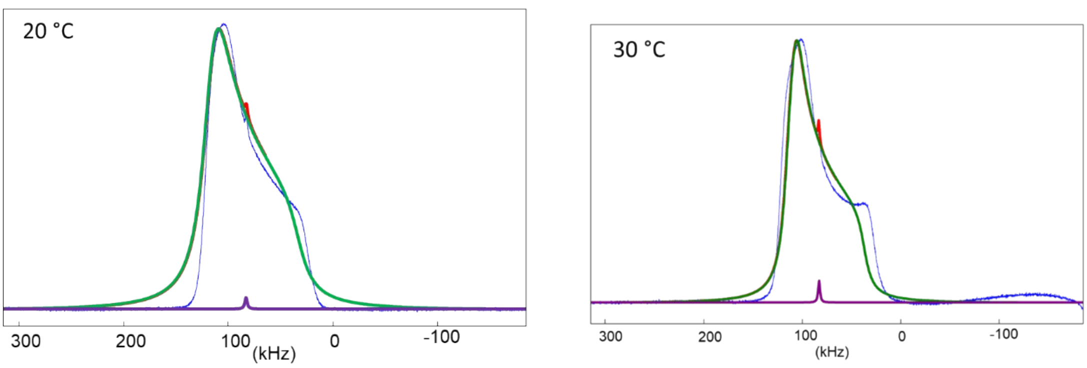

Figure S7: The deconvolution of the broad asymmetric peaks of [$C_{(i3)}$mmor][FSI] considering CSA parameters at 20 °C and 30 °C

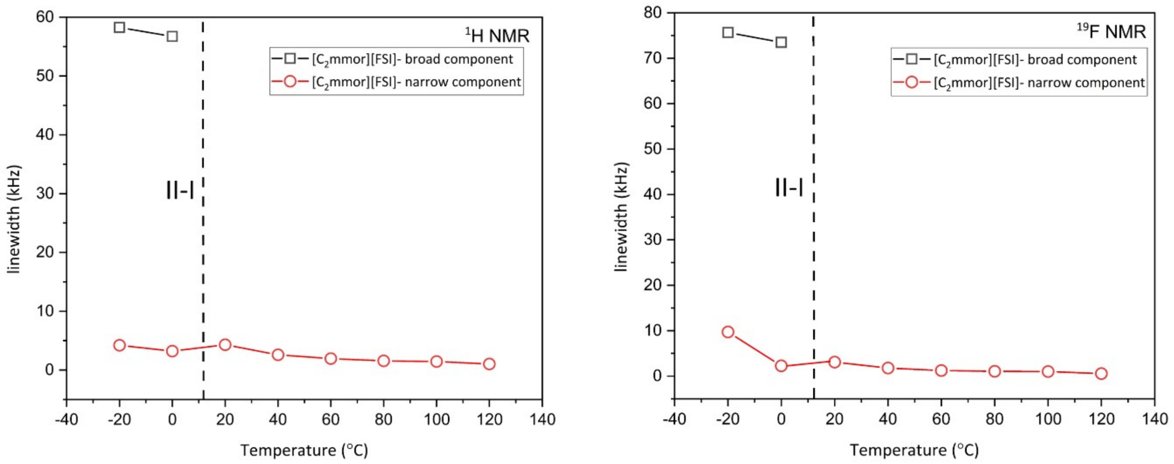

Figure S8: linewidth analysis of [C_2mmor][FSI] :static ^{1}H NMR (left) and ^{19}F NMR (right)

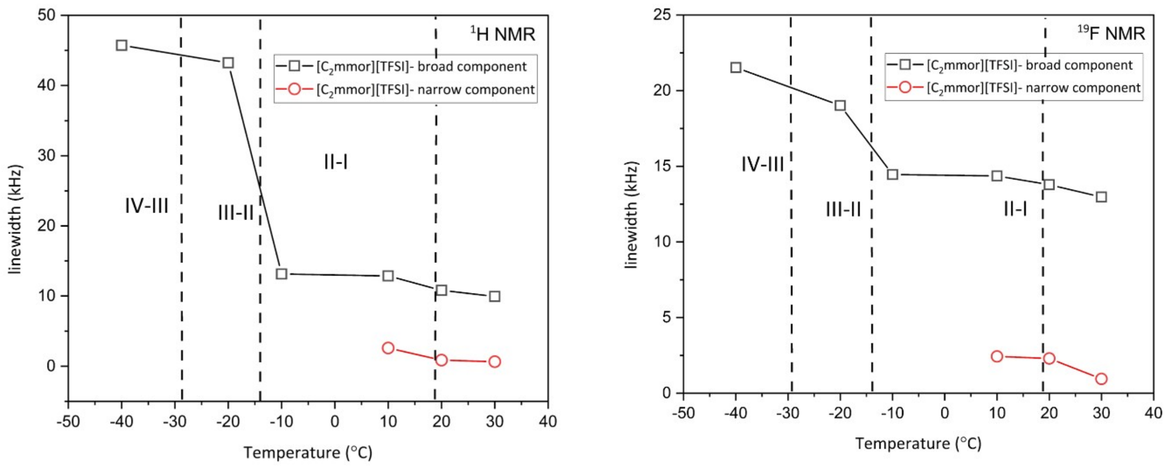

Figure S9: linewidth analysis of [C_2mmor][TFSI]: static ^{1}H NMR (left) and ^{19}F NMR(right)

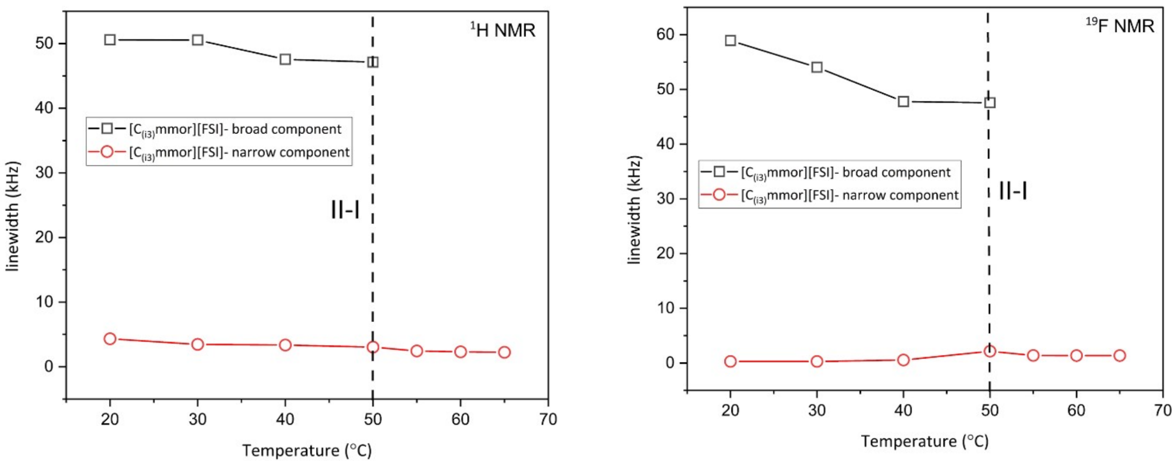

Figure S10:linewidth analysis of [$C_{(i3)}$mmor][FSI]: ^{1}H static NMR (left) and ^{19}F NMR (right)

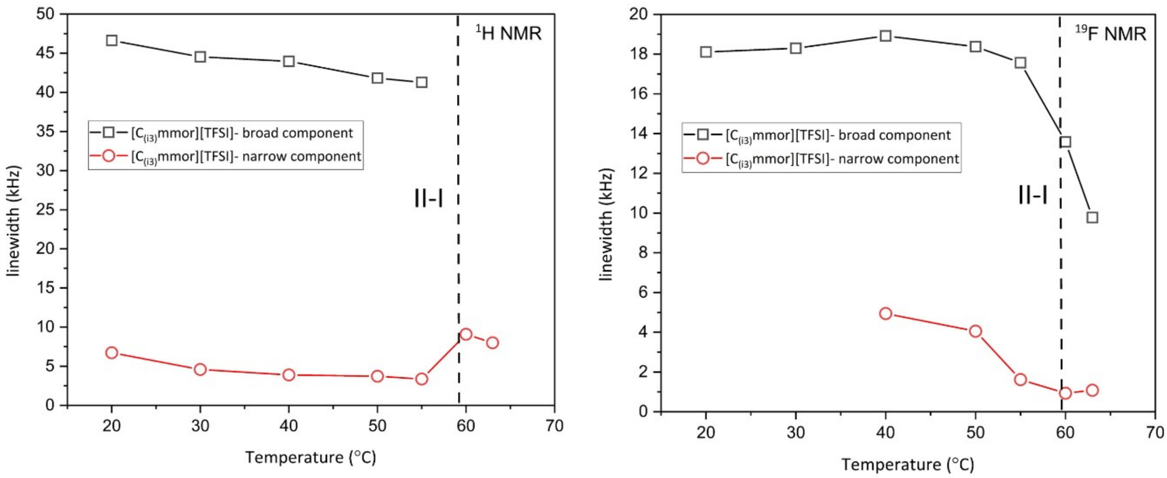

Figure S11:linewidth analysis of [$C_{(i3)}$mmor][TFSI]: ^{1}H NMR(left) and ^{19}F NMR(right)

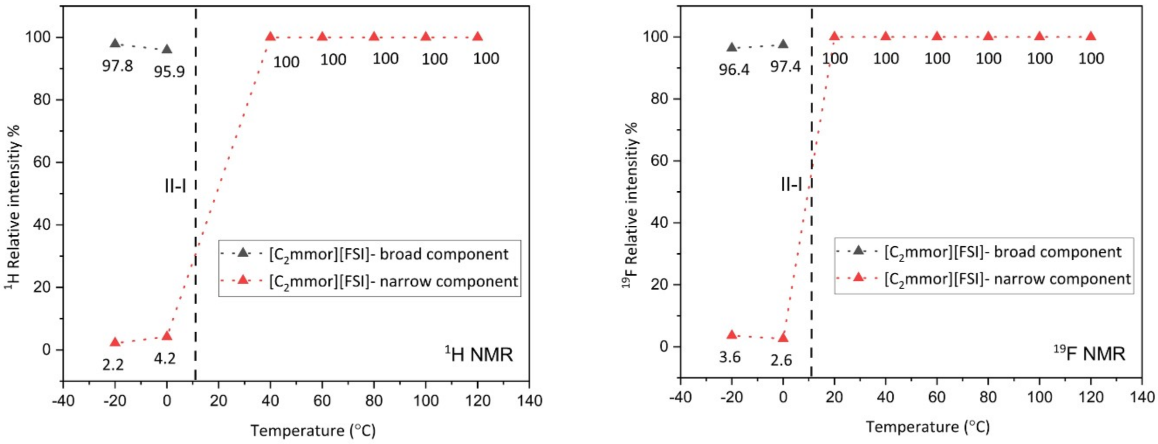

Figure S12: solid-state NMR, Temperature vs relative intensity percentage values for [C_2mmor][FSI] salt: ^{1}H NMR (left) and ^{19}F NMR (right). A quantitative analysis can be made of the fraction of relatively static and more dynamic cations at the respective temperatures.

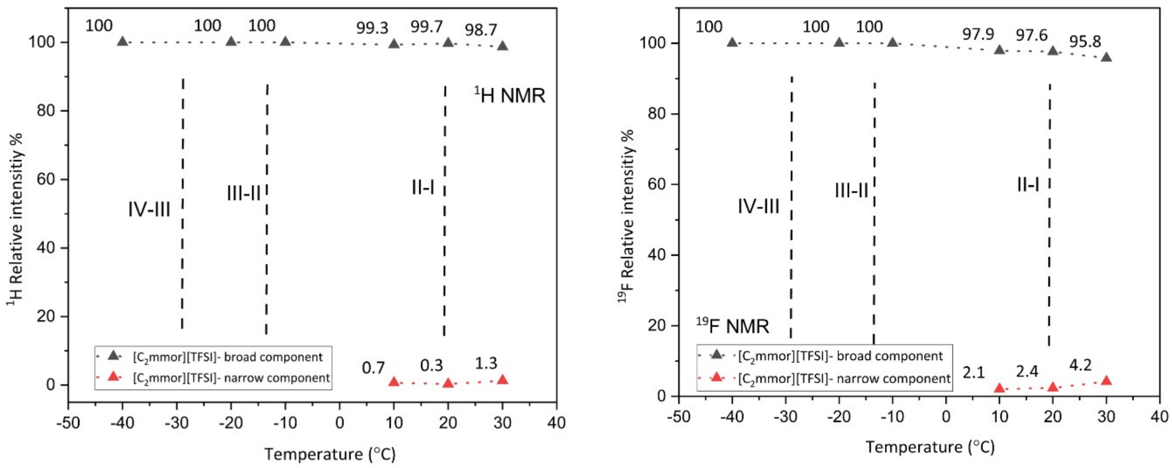

Figure S13: solid-state NMR, temperature vs relative intensity percentage values for [C_2mmor][TFSI] salt: ^{1}H NMR (left) and ^{19}F NMR (right).

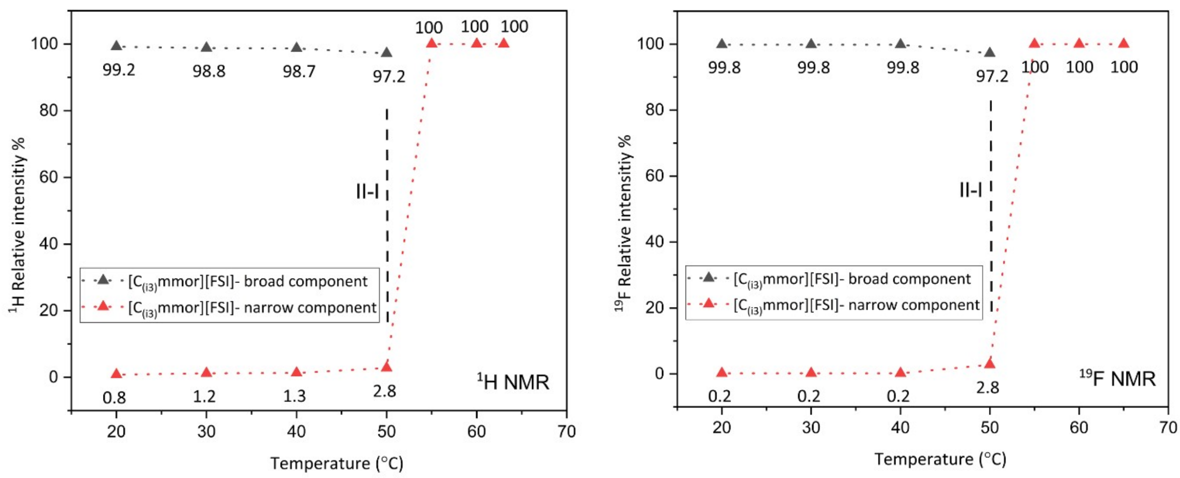

Figure S14: solid-state NMR, temperature vs relative intensity percentage values for [C$_{(i3)}$mmor][FSI] salt: ^{1}H NMR (left) ^{19}F NMR (right).

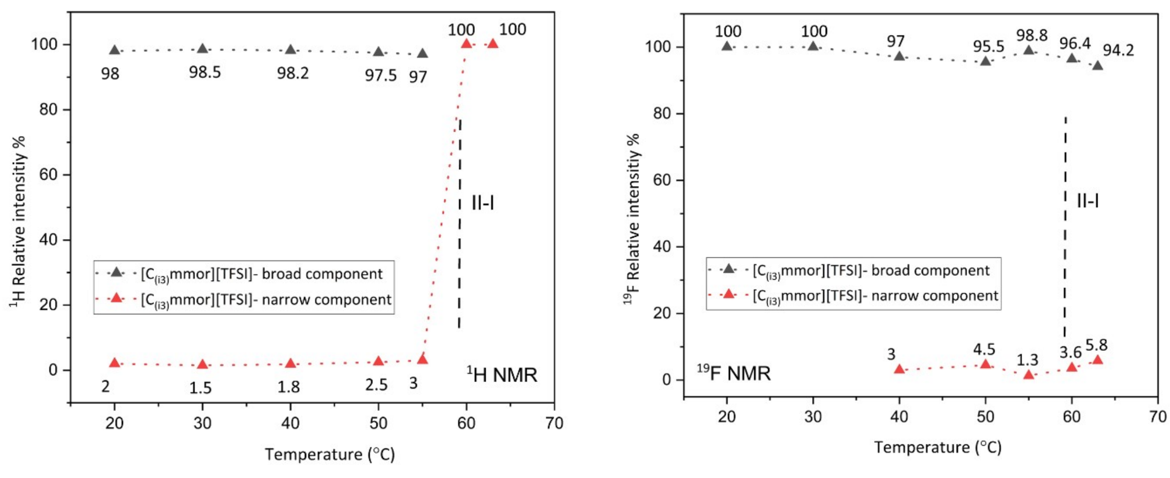

Figure S15: solid-state NMR, temperature vs relative intensity percentage values for [C$_{(i3)}$mmor][TFSI] salt: ^{1}H NMR (left) ^{19}F NMR (right).