

## Supporting Information for

### Interesting phase behaviors and ion-conducting properties of dicationic N-alkylimidazolium tetrafluoroborate salts

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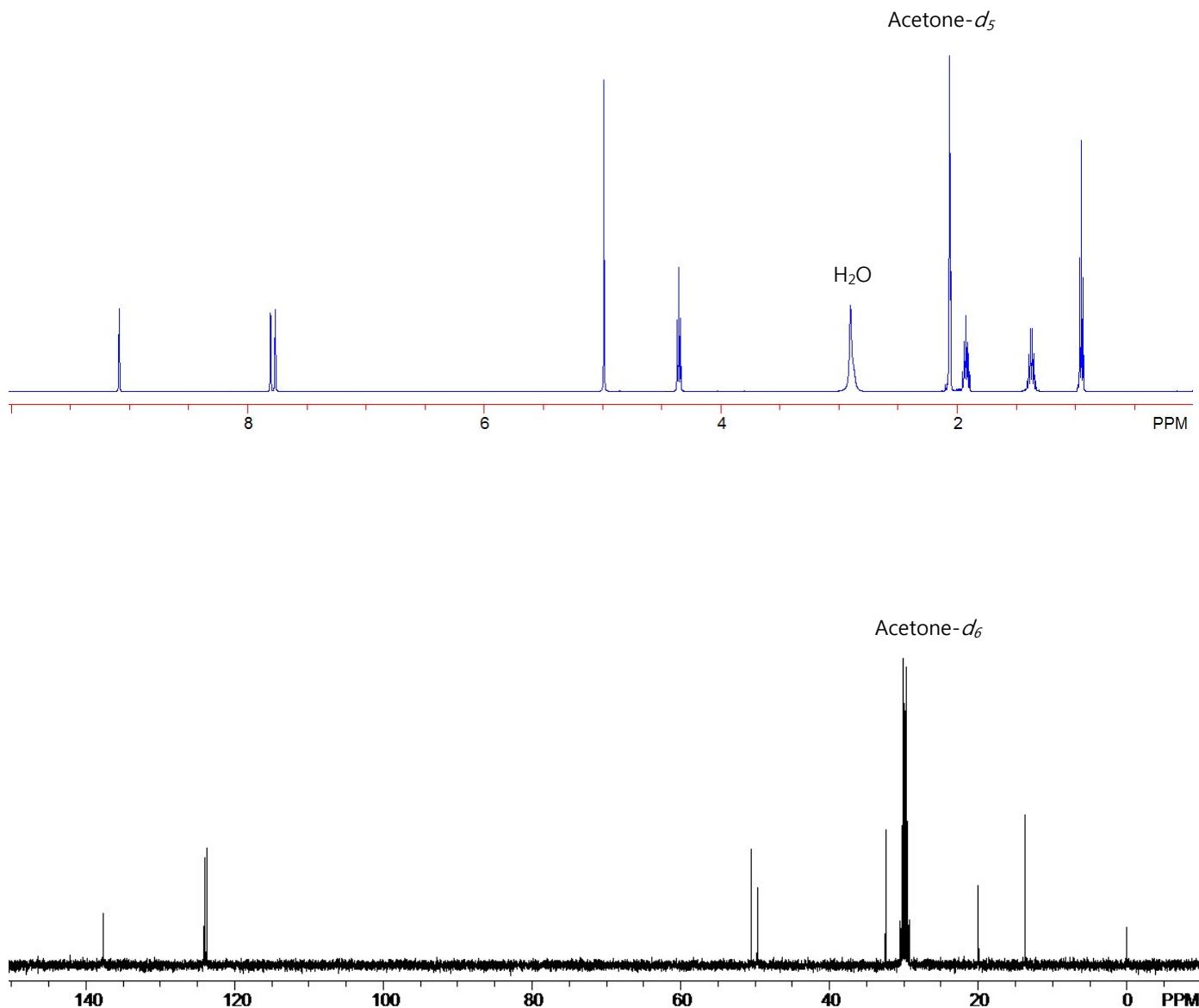
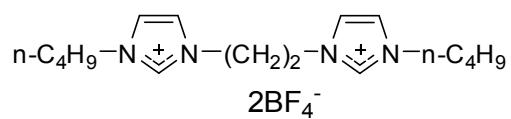
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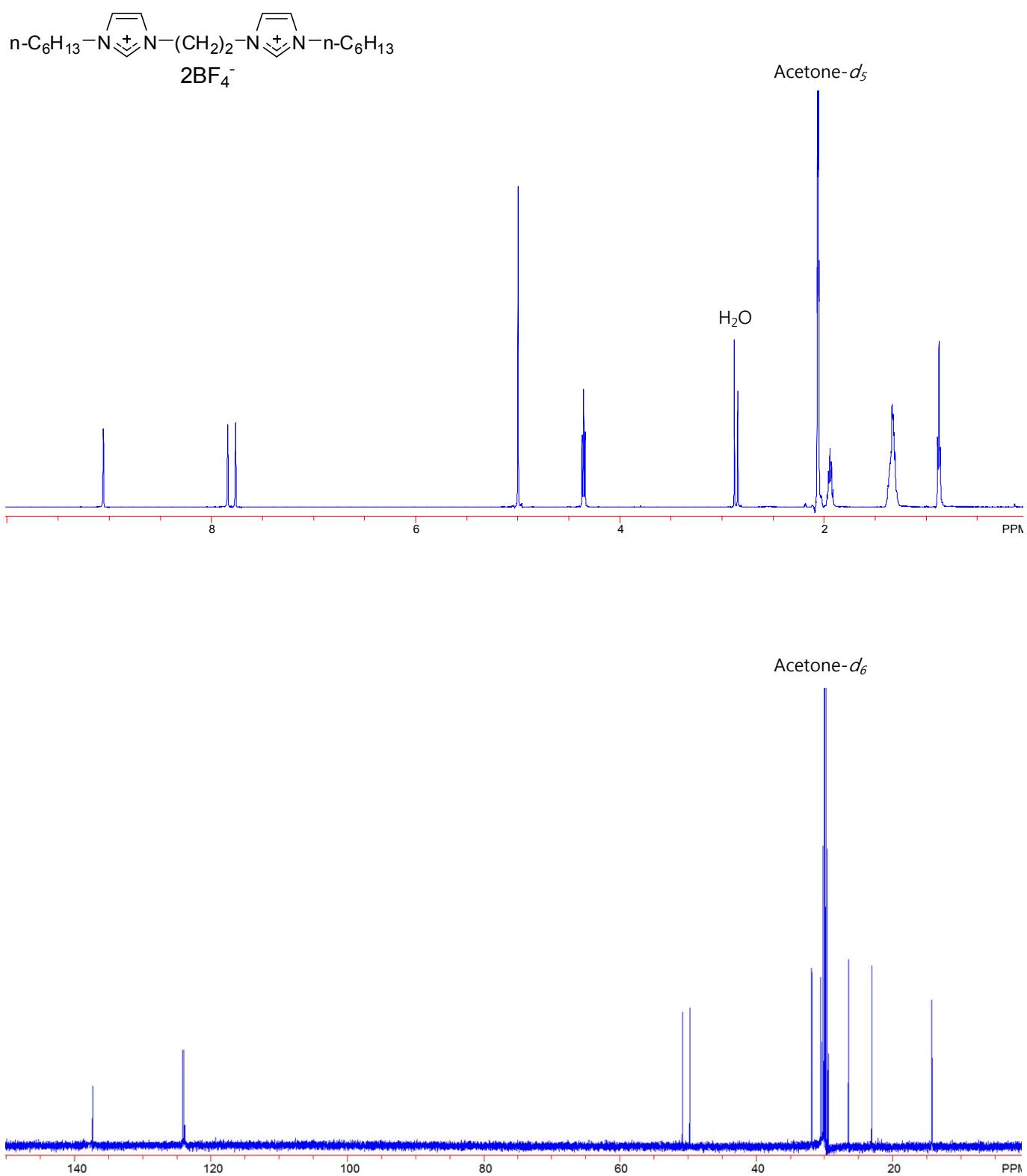
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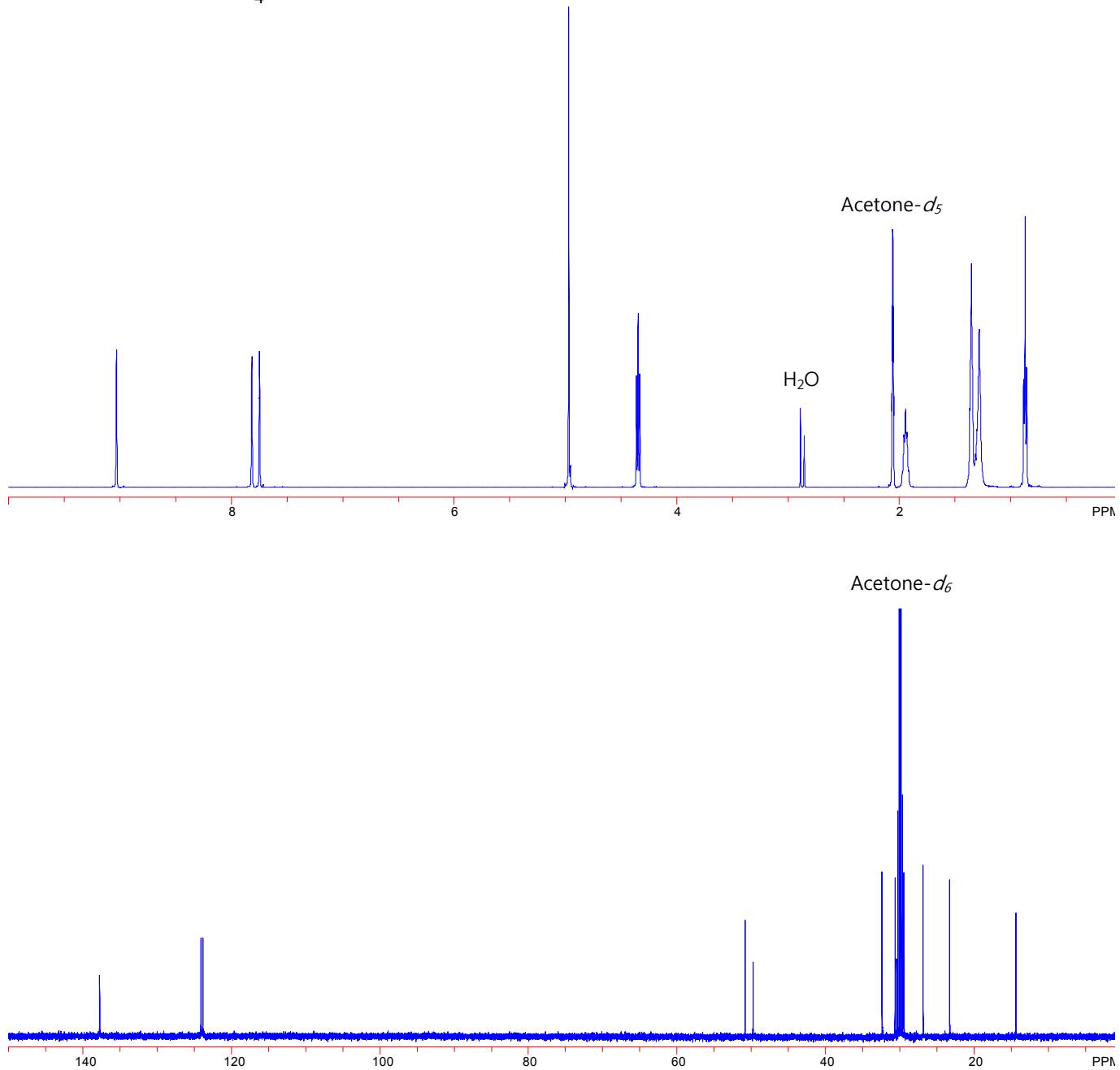
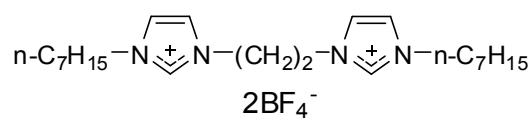
- 1)  $^1\text{H}$  and  $^{13}\text{C}$  NMR Spectra of the synthesized dicationic bis-imidazolium salts
- 2) DSC and TGA thermograms of the synthesized dicationic bis-imidazolium salts
- 3) Ionic conductivity (left axis) as a function of temperature while heating combined with DSC cooling traces (right axis) for C7.



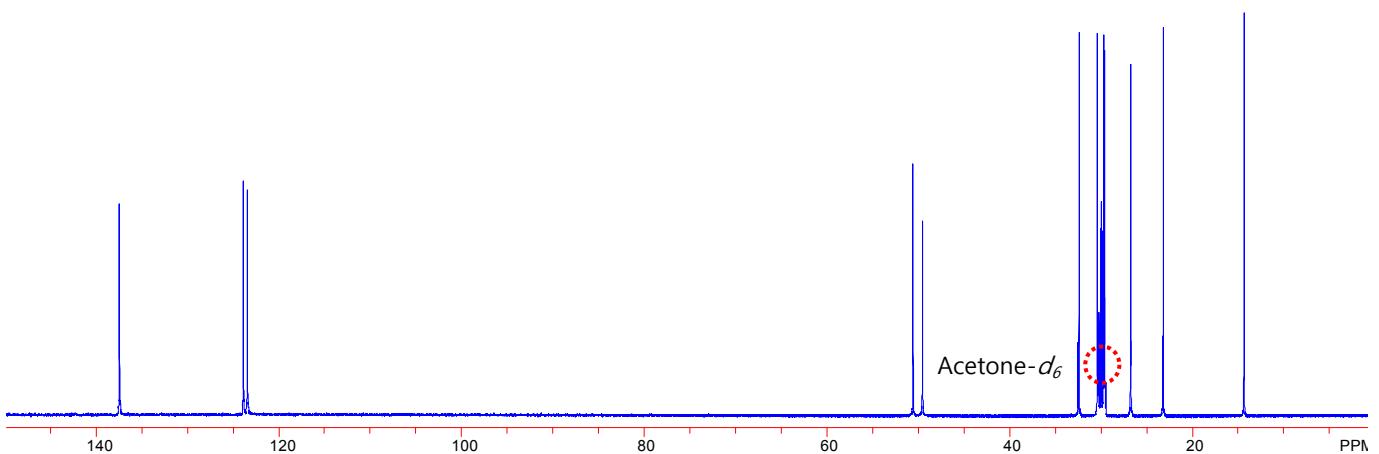
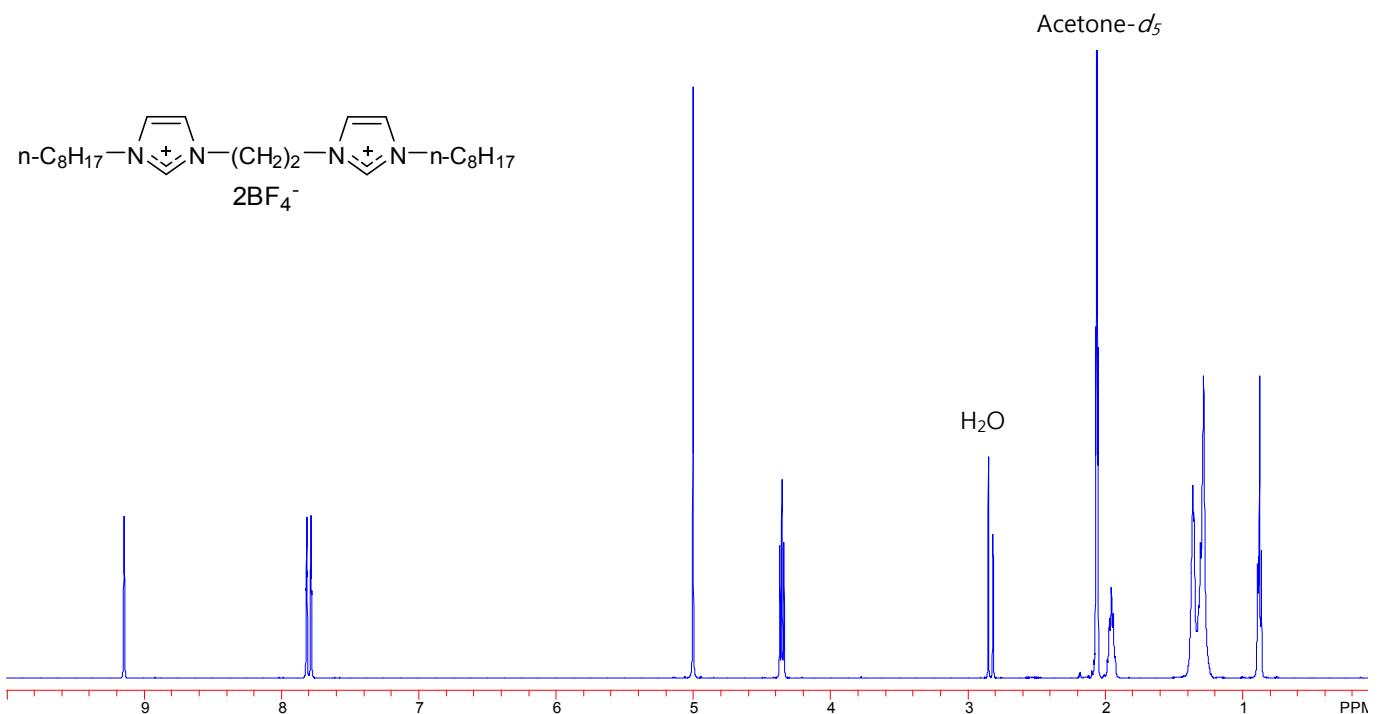
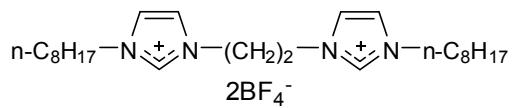
**Figure S1.** 400 MHz  $^1\text{H}$  NMR and 100 MHz  $^{13}\text{C}$  NMR spectrum of 1,2-Bis[N-(N'-butylimidazolium)]ethane 2BF<sub>4</sub><sup>-</sup> (**C4**) (acetone- $d_6$ , 23 °C).



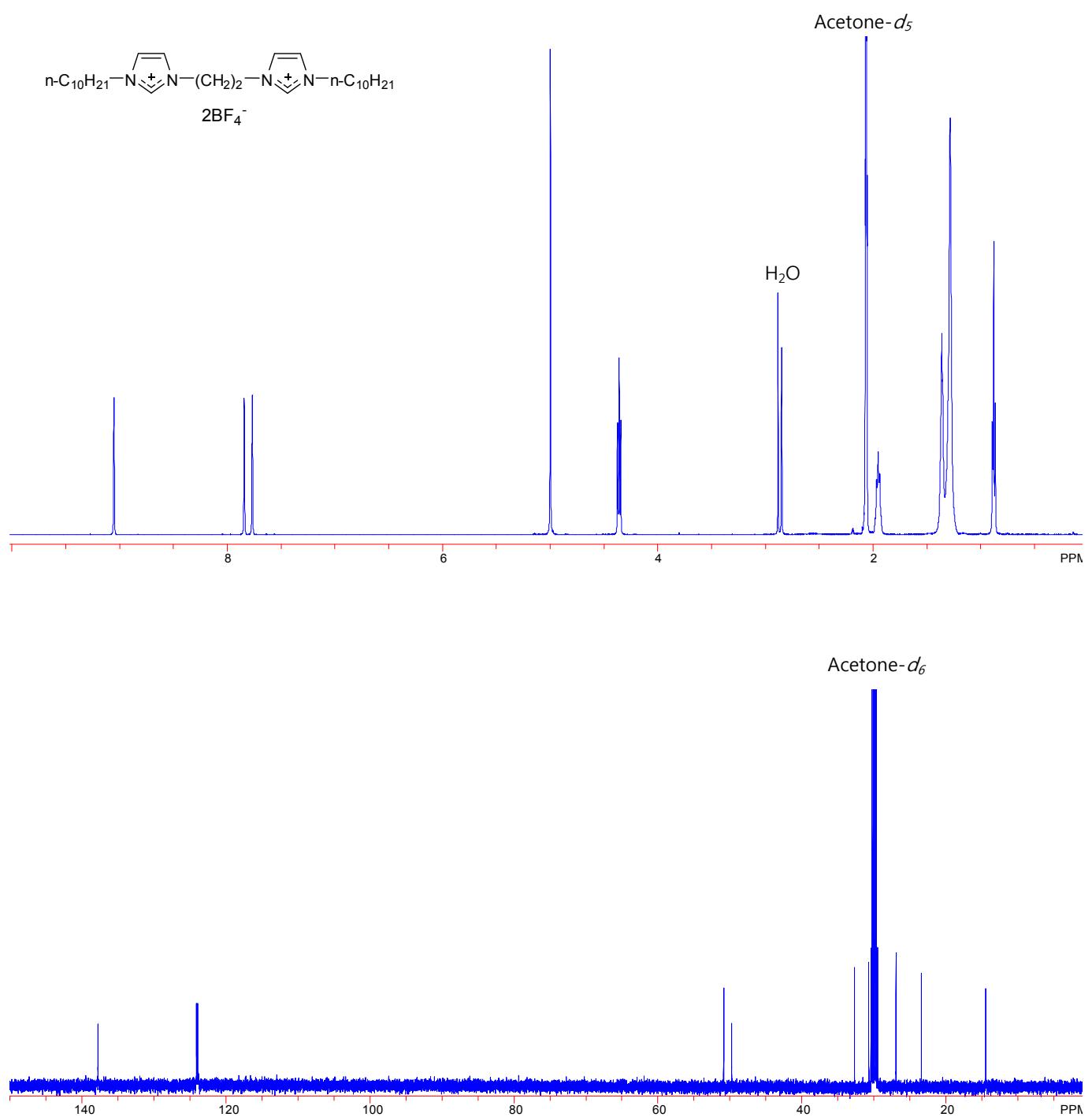
**Figure S2.**  $^1\text{H}$  (upper) and  $^{13}\text{C}$  (lower) NMR spectra of 1,2-Bis[N-(N'-hexylimidazolium)]ethane 2BF<sub>4</sub><sup>-</sup> (**C6**) (acetone- $d_6$ , 23 °C).



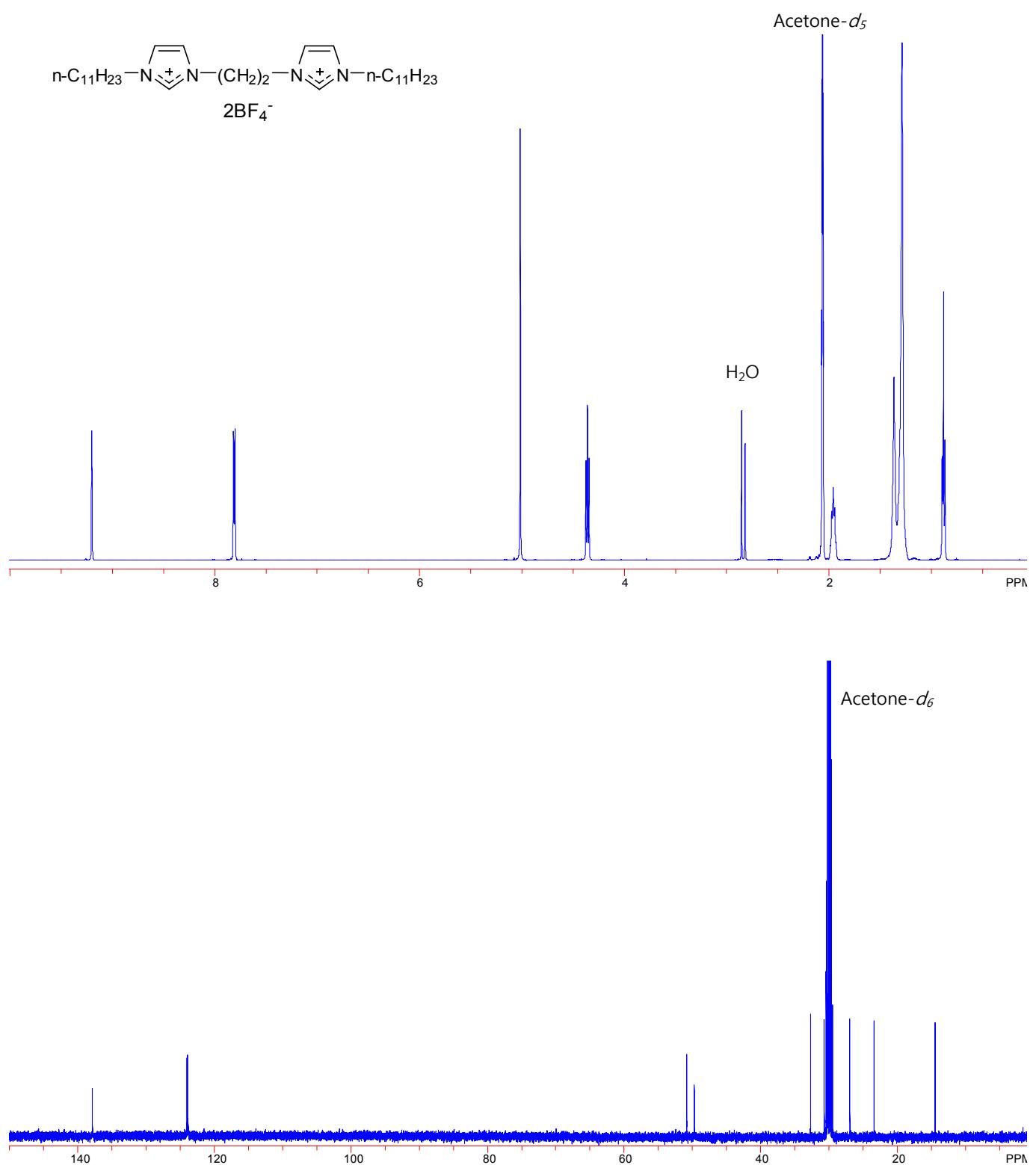
**Figure S3.**  $^1\text{H}$  (upper) and  $^{13}\text{C}$  (lower) NMR spectra of 1,2-Bis[N-(N'-heptylimidazolium)]ethane 2BF<sub>4</sub><sup>-</sup> (**C7**) (acetone- $d_6$ , 23 °C).



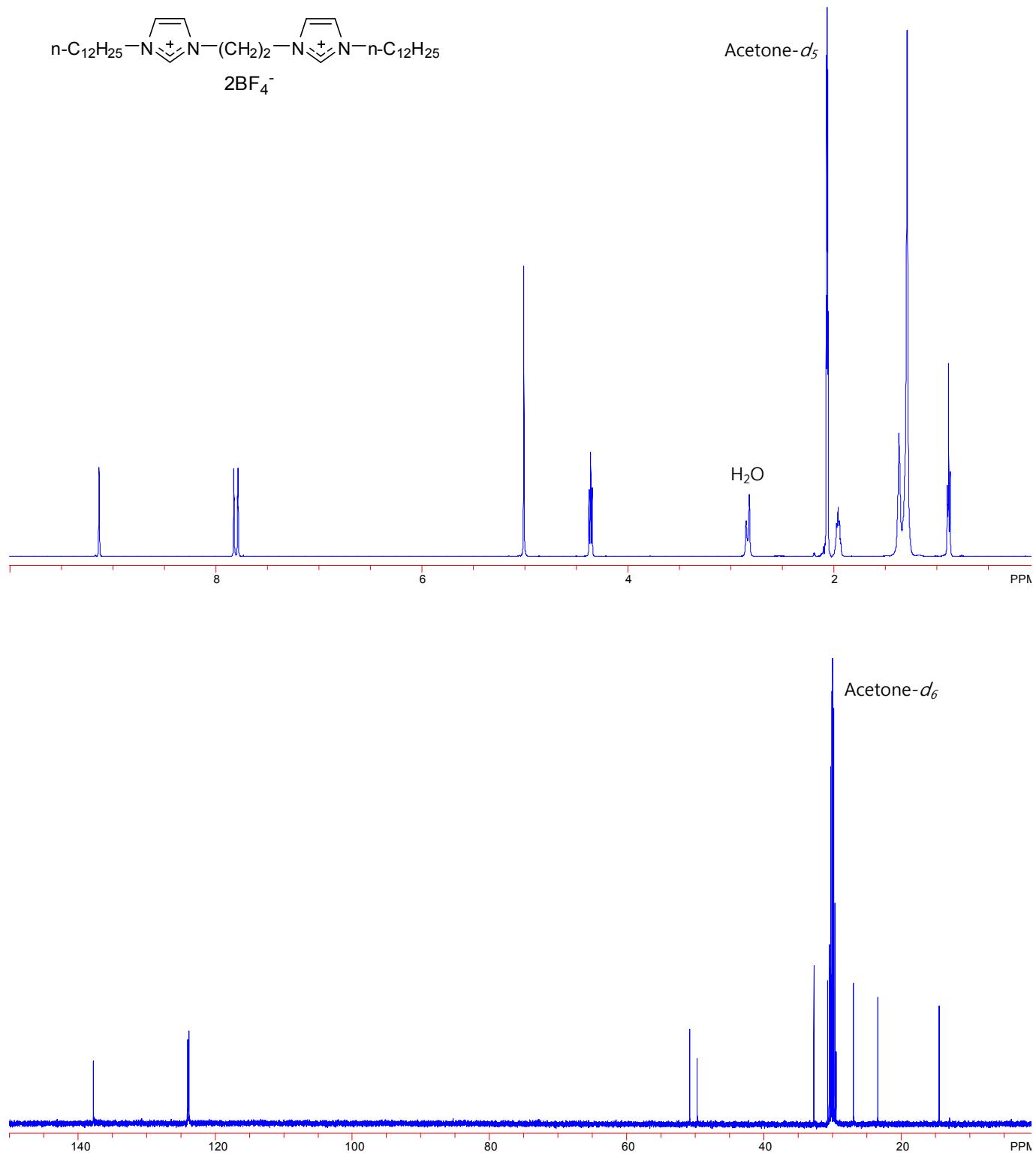
**Figure S4.**  $^1\text{H}$  (upper) and  $^{13}\text{C}$  (lower) NMR spectra of 1,2-Bis[N-(N'-octylimidazolium)]ethane 2BF<sub>4</sub><sup>-</sup> (**C8**) (acetone-*d*<sub>6</sub>, 23 °C).



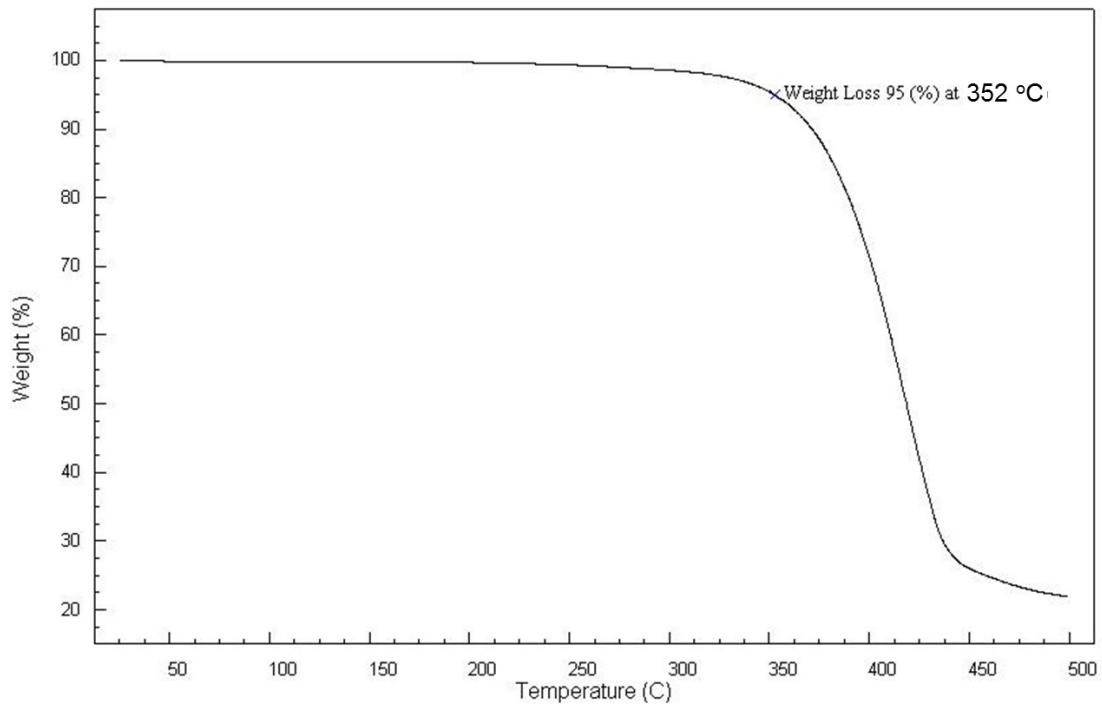
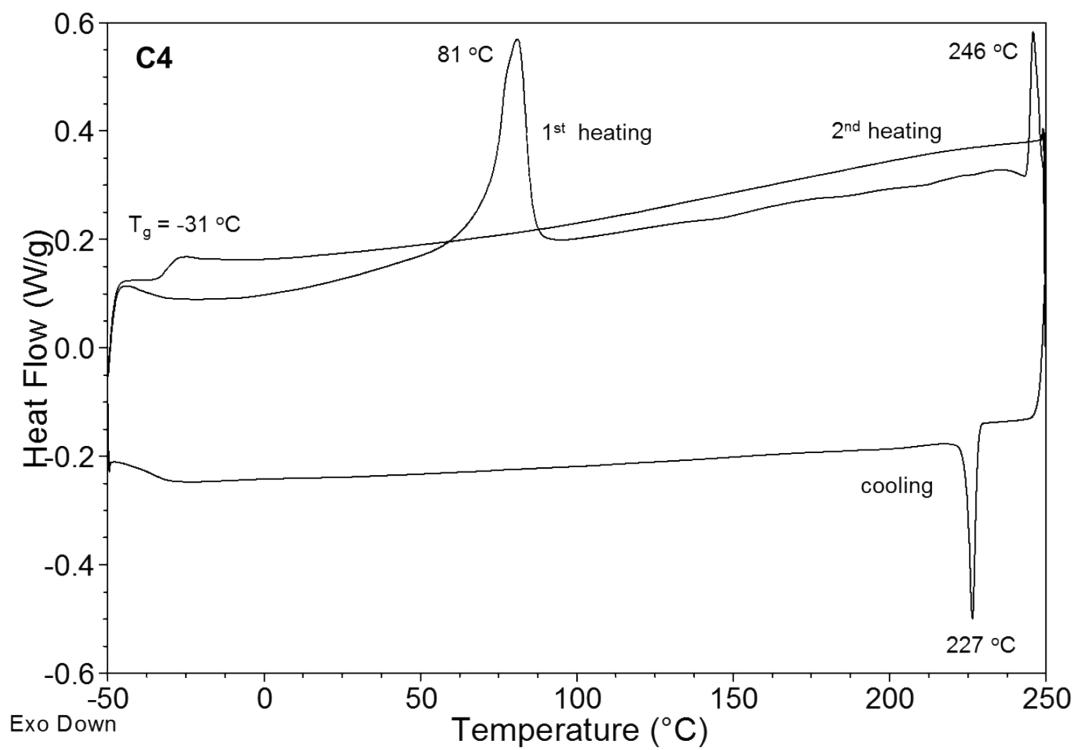
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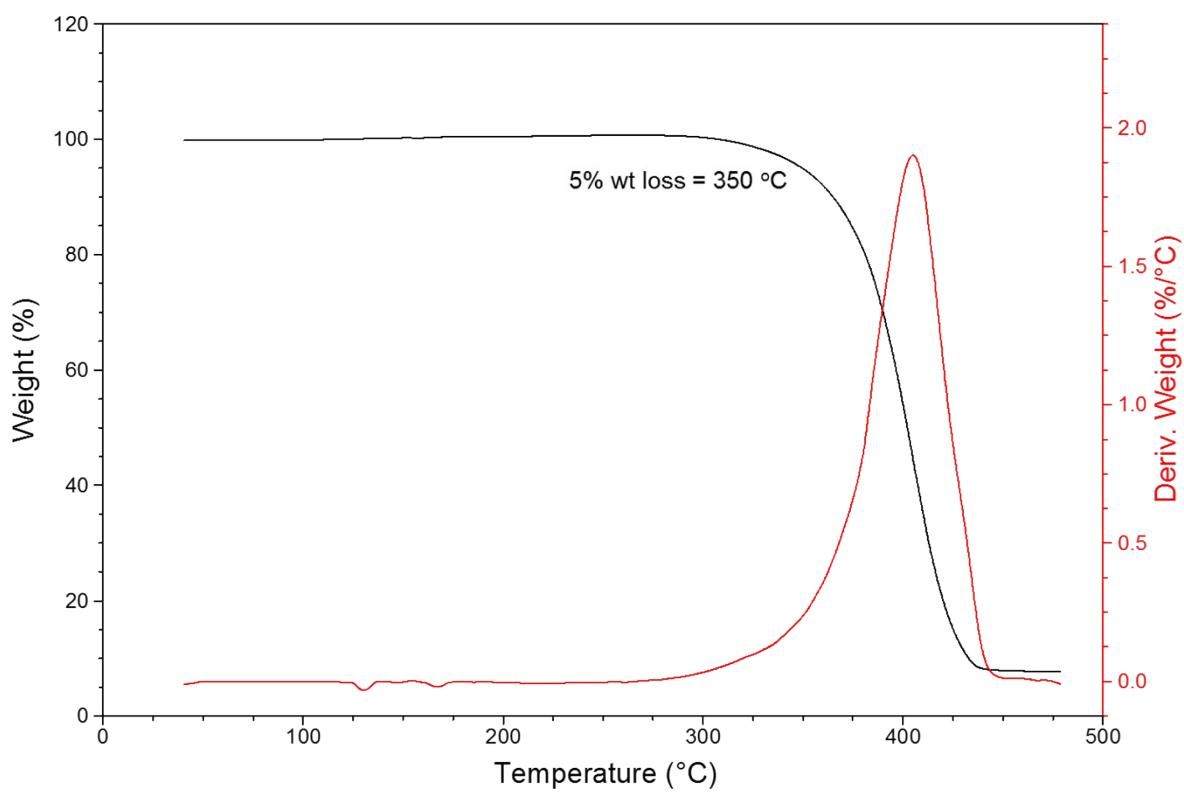
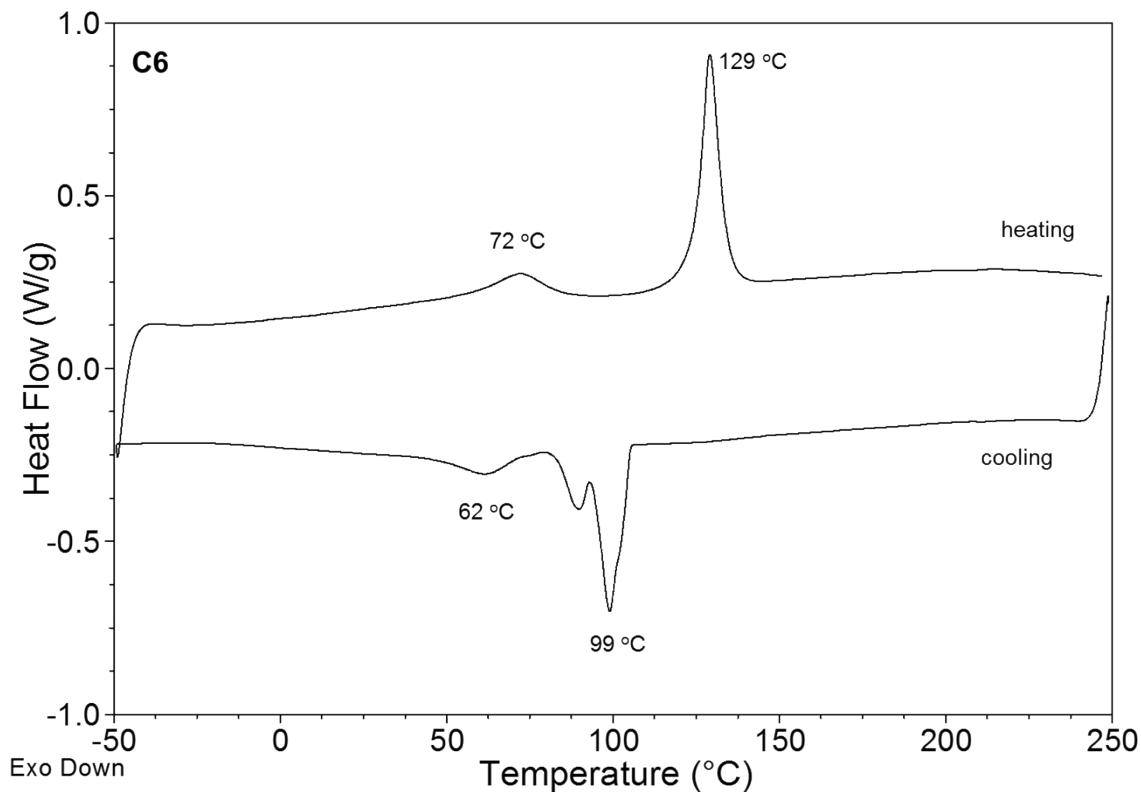
**Figure S6.**  $^1\text{H}$  (upper) and  $^{13}\text{C}$  (lower) NMR spectra of 1,2-Bis[N-(N'-undecylimidazolium)]ethane 2BF<sub>4</sub><sup>-</sup> (**C11**) (acetone- $d_6$ , 23 °C).



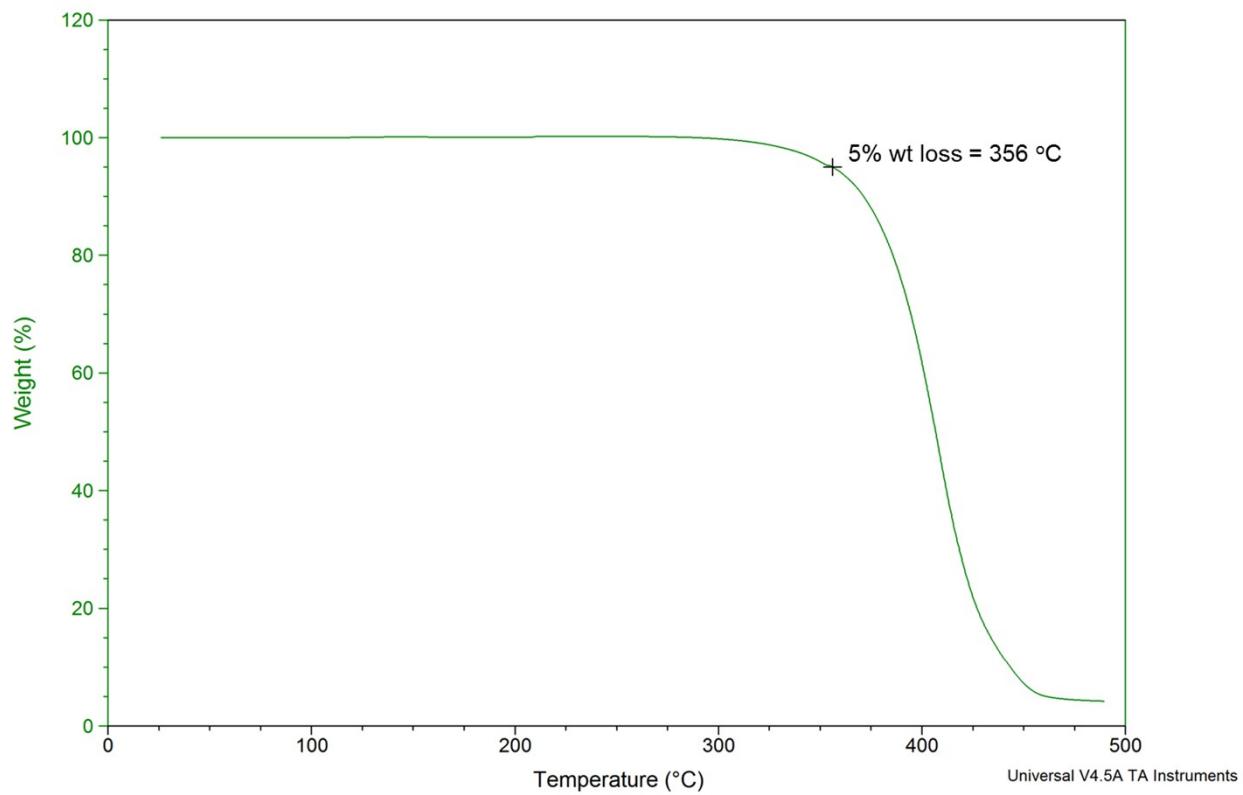
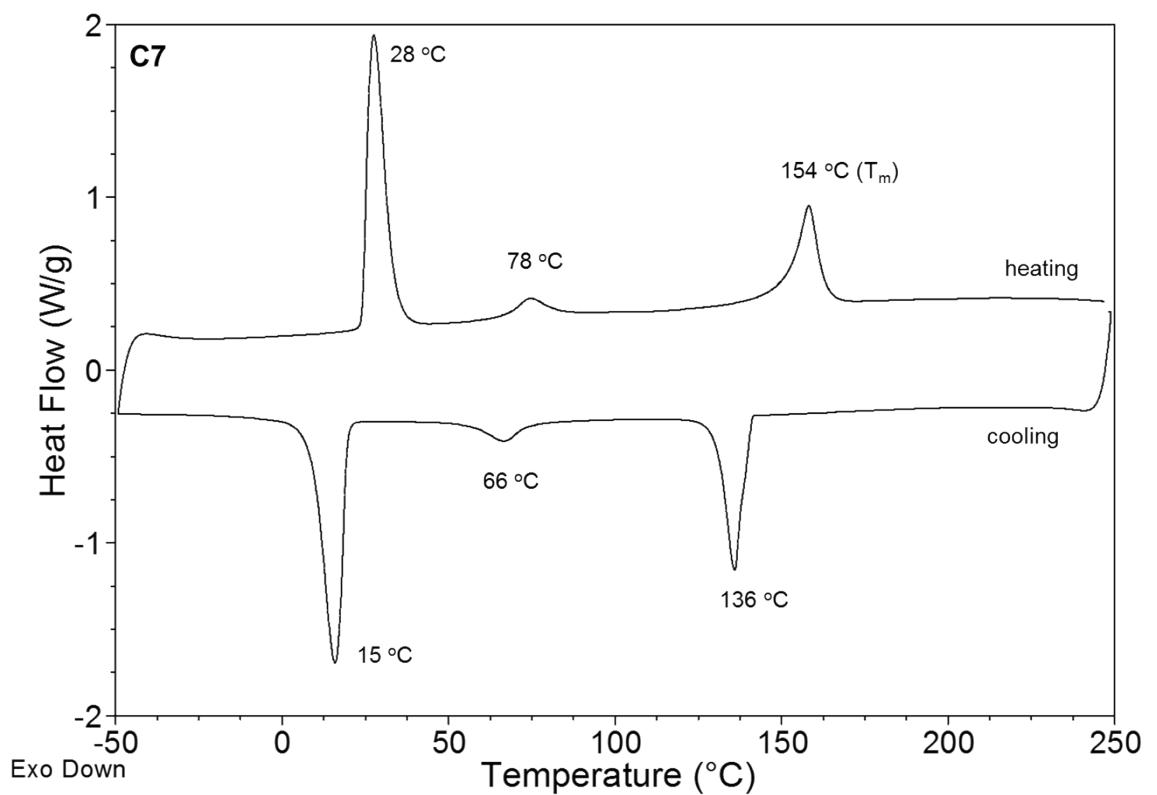
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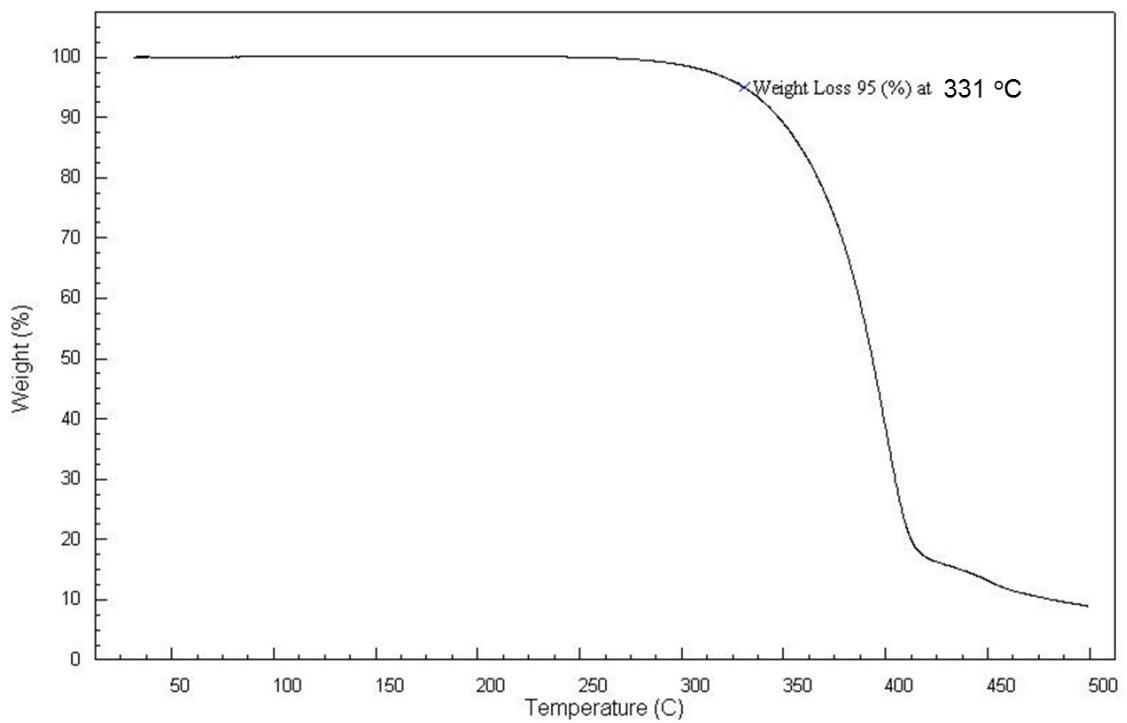
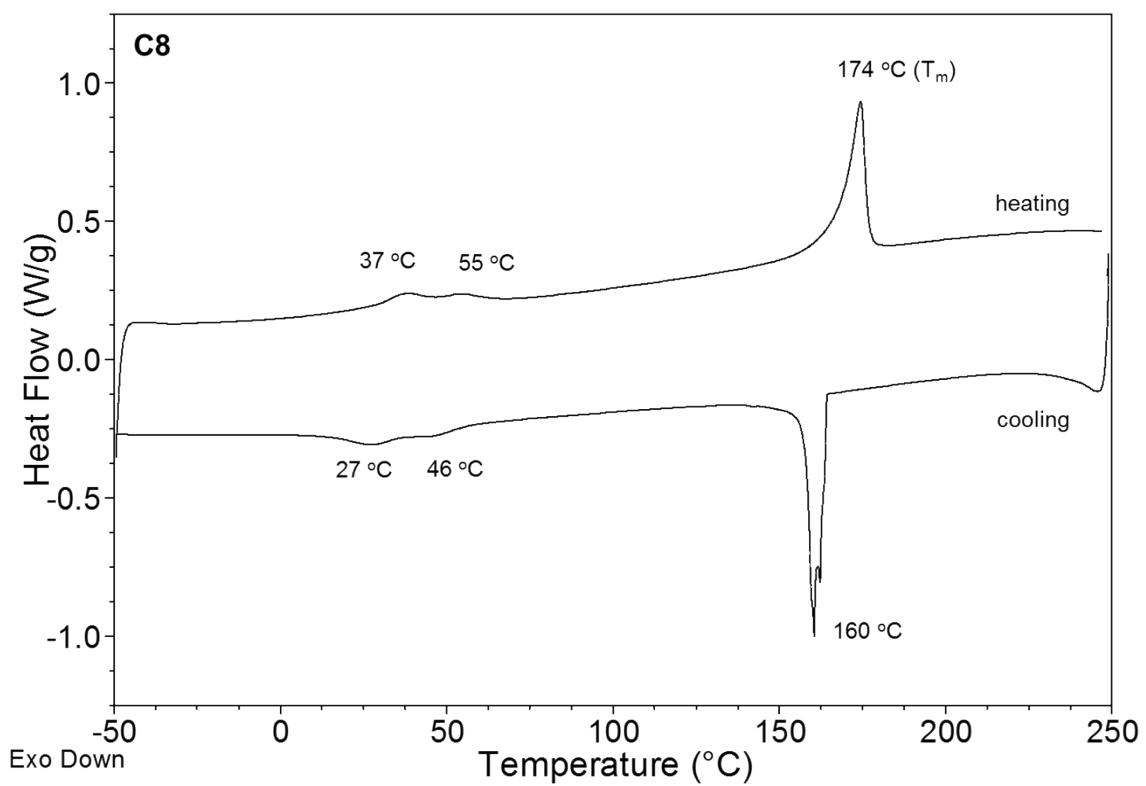
**Figure S8.** DSC and TGA traces of 1,2-Bis[N-(N'-butylimidazolium)]ethane 2BF<sub>4</sub><sup>-</sup> (**C4**)



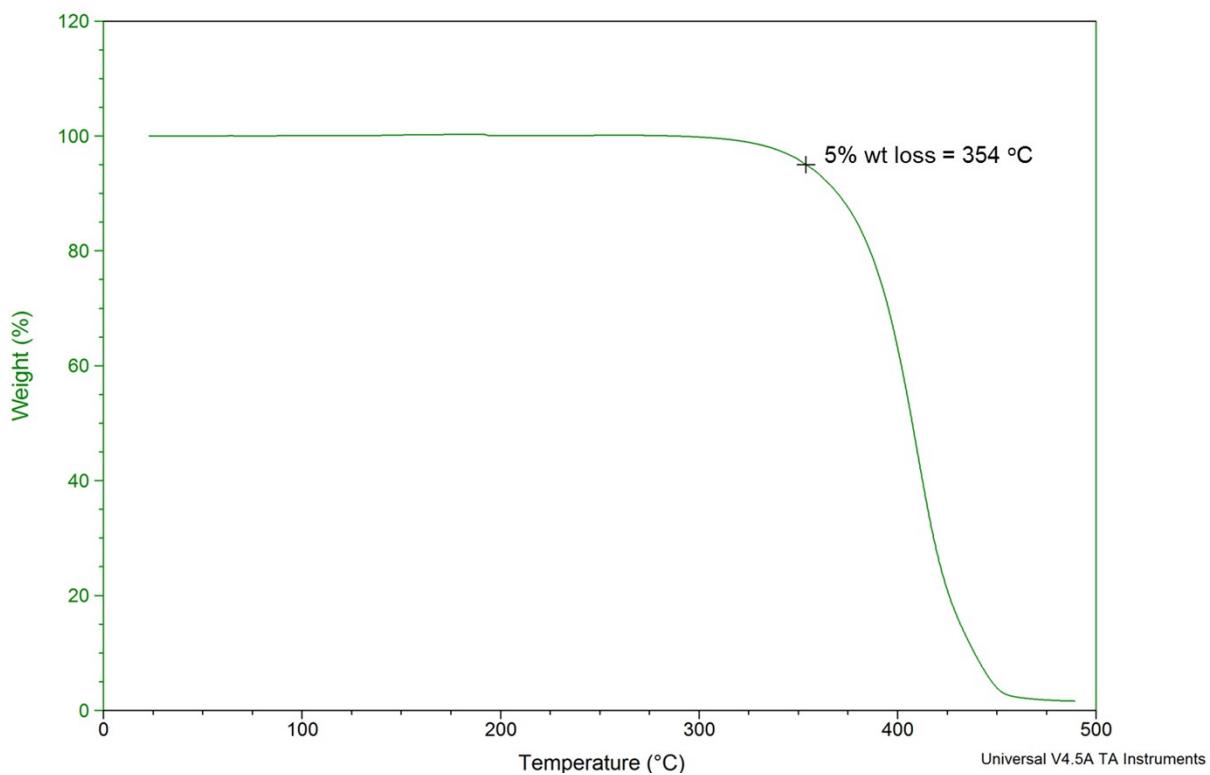
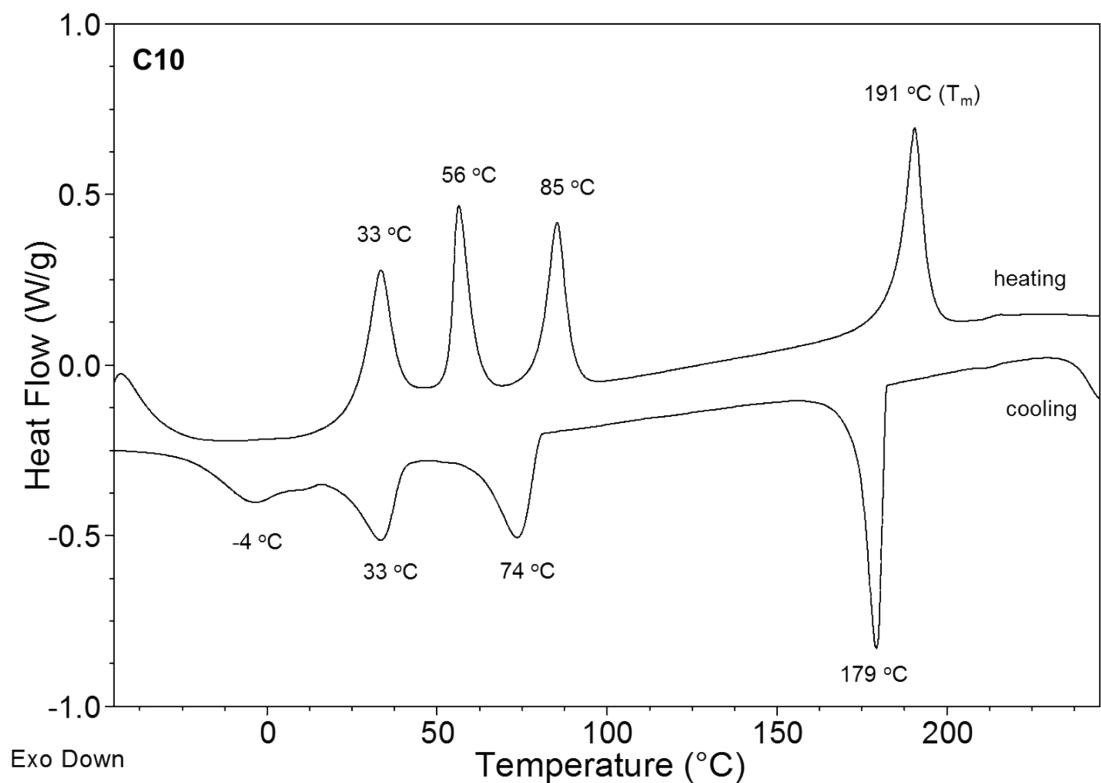
**Figure S9.** DSC and TGA traces of 1,2-Bis[N-(N'-hexylimidazolium)]ethane 2BF<sub>4</sub><sup>-</sup> (**C6**).



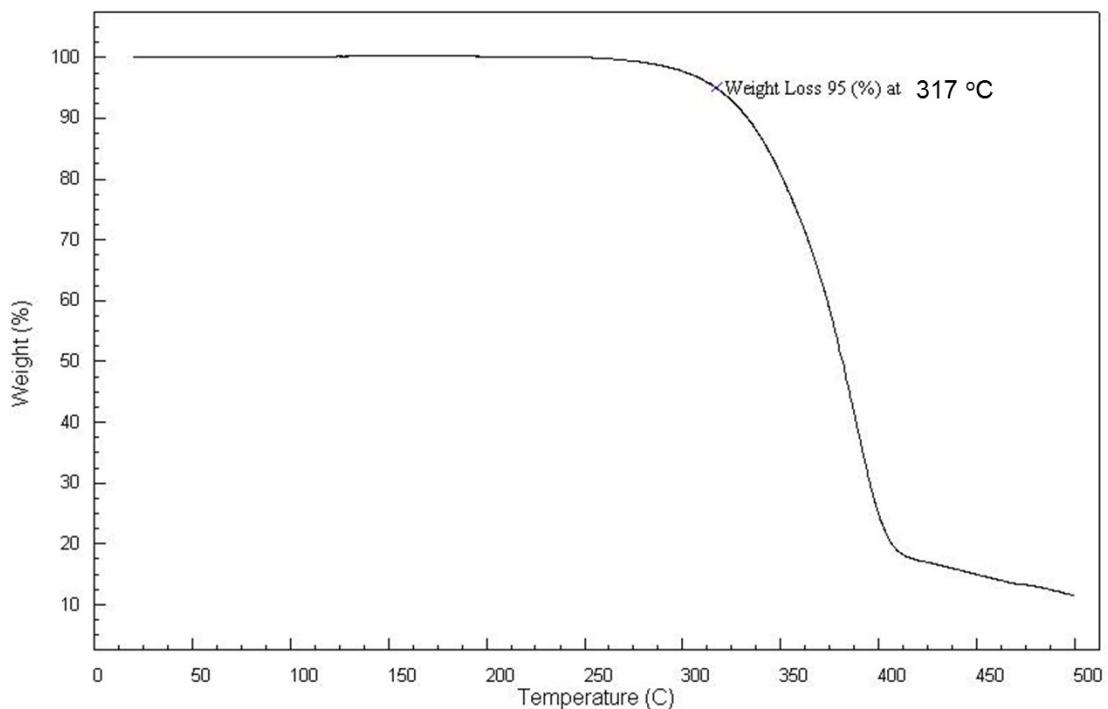
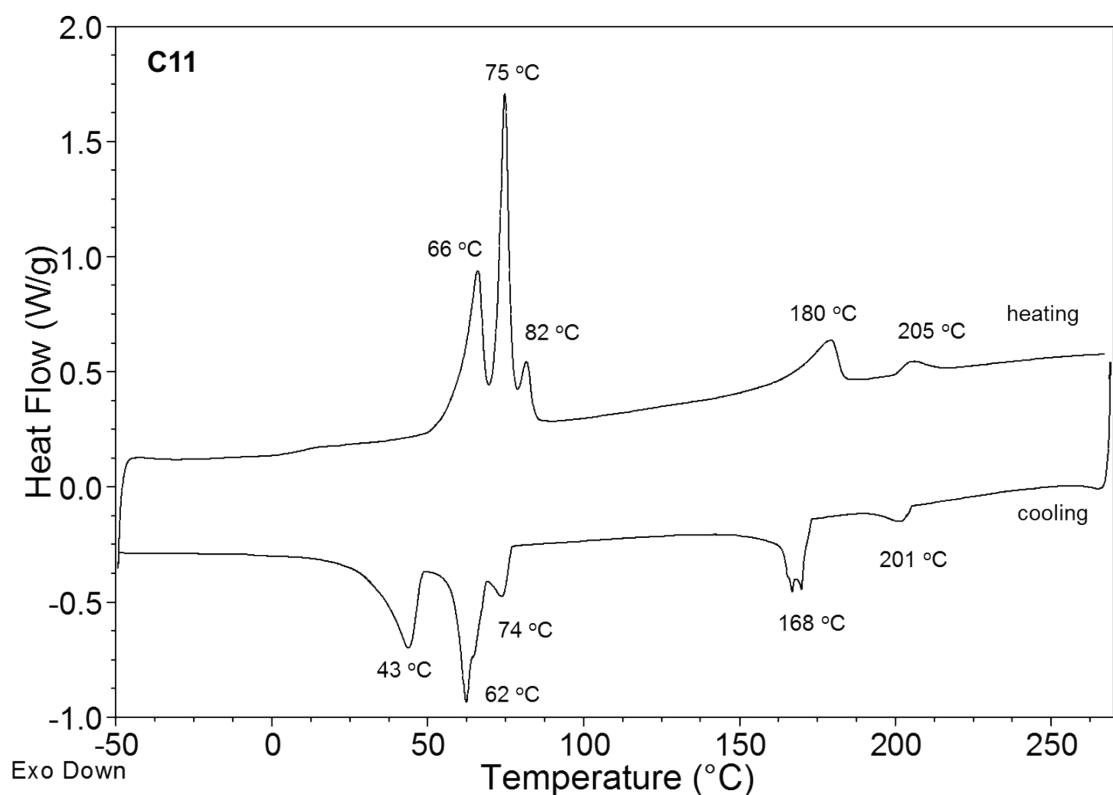
**Figure S10.** DSC and TGA traces of 1,2-Bis[N-(N'-heptylimidazolium)]ethane 2BF<sub>4</sub><sup>-</sup> (**C7**)



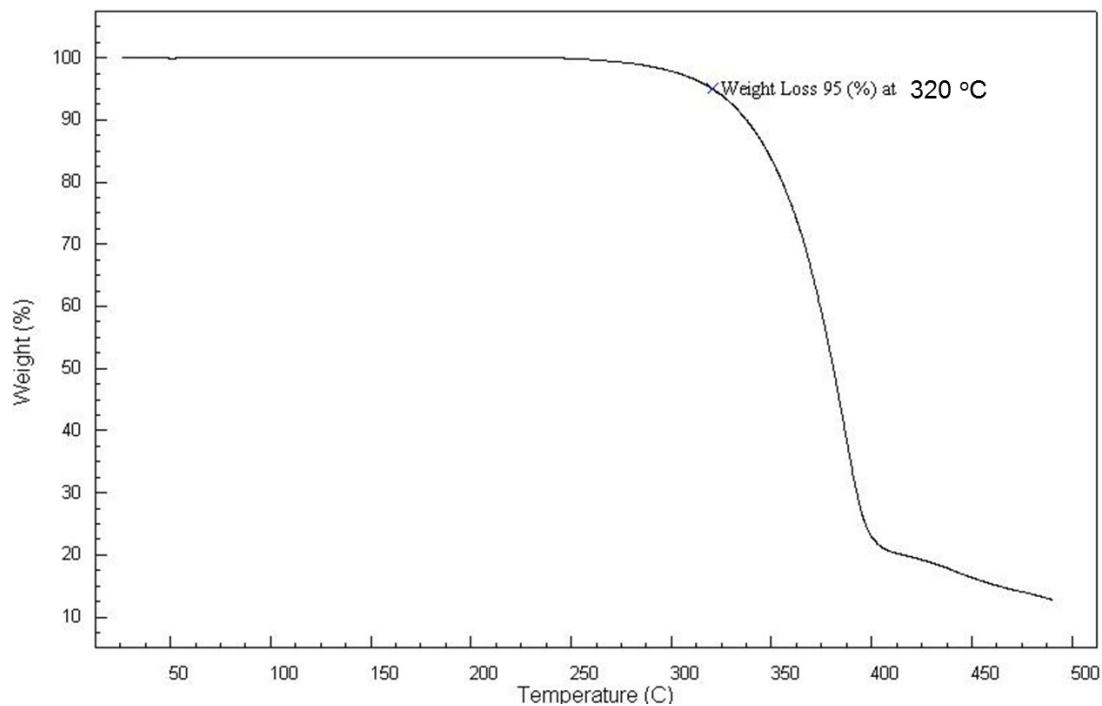
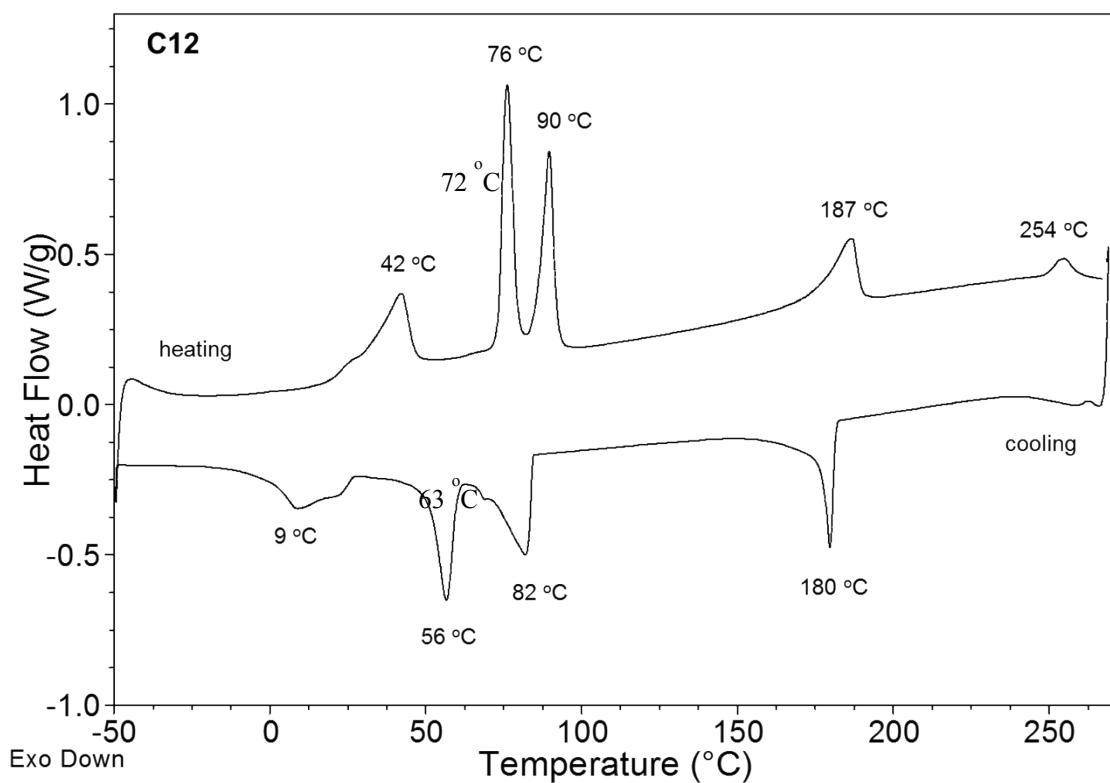
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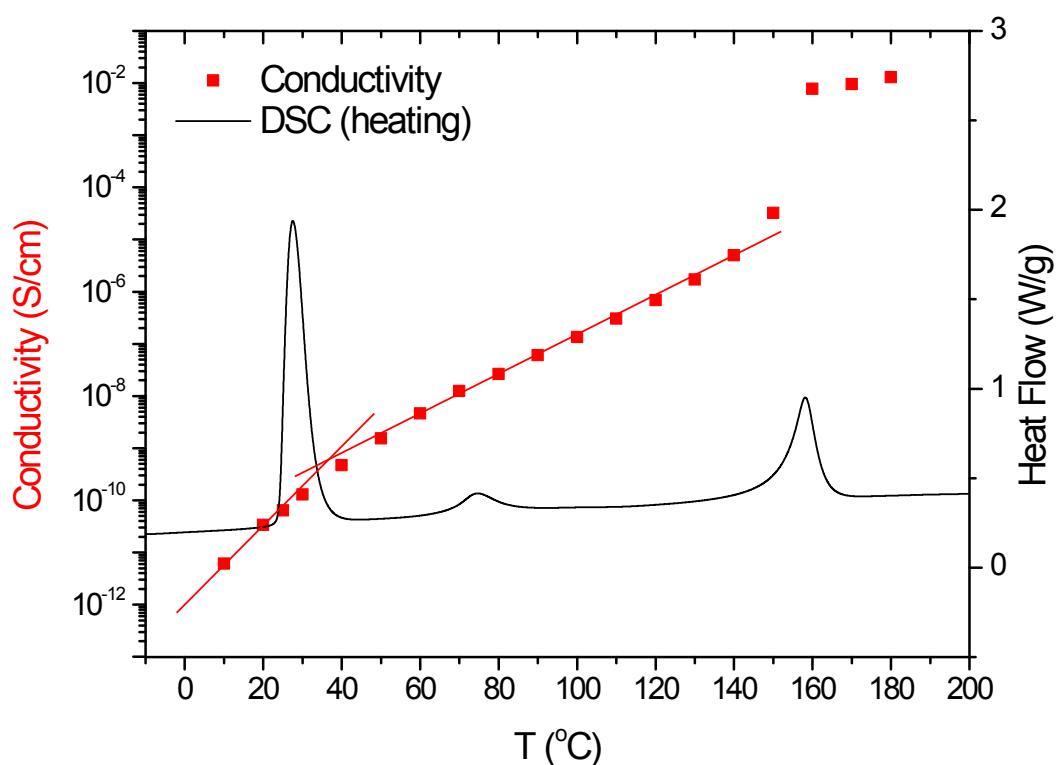
**Figure S12.** DSC and TGA traces of 1,2-Bis[N-(N'-decylimidazolium)]ethane 2BF<sub>4</sub><sup>-</sup> (**C10**)



**Figure S13.** DSC and TGA traces of 1,2-Bis[N-(N'-undecylimidazolium)]ethane 2BF<sub>4</sub><sup>-</sup> (**C11**)



**Figure S14.** DSC and TGA traces of 1,2-Bis[N-(N'-doecylimidazolium)]ethane 2BF<sub>4</sub><sup>-</sup> (**C12**)



**Figure S15.** Ionic conductivity (left axis) as a function of temperature while heating combined with DSC cooling traces (right axis) for C7.