

## Supporting Information

### Reversible hierarchical structure induced by solvation and temperature modulation in an ionic liquid-based random bottlebrush copolymer

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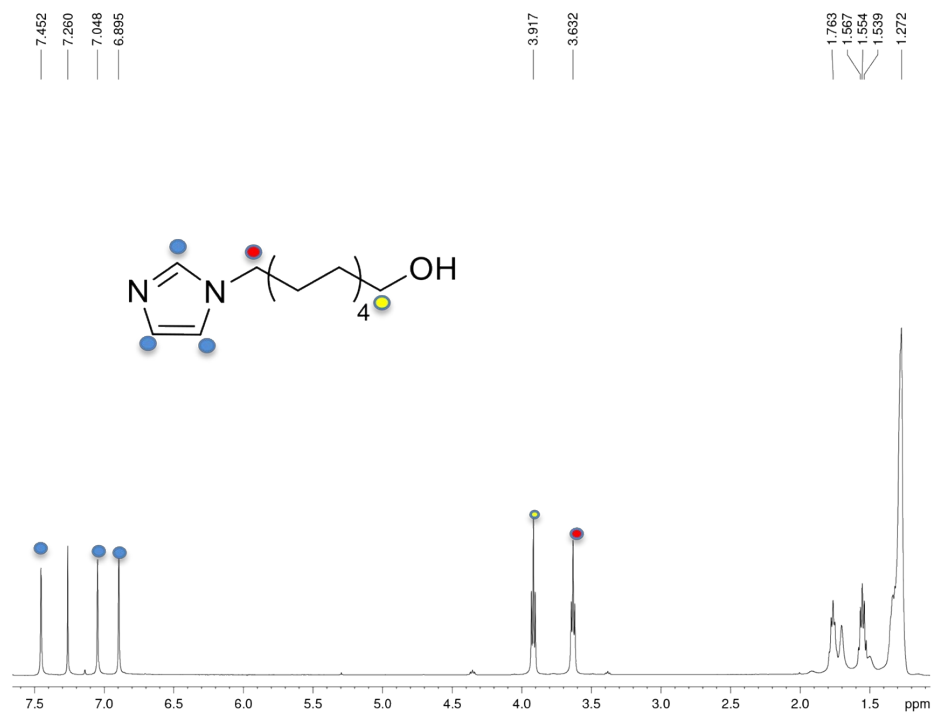


Figure S1. <sup>1</sup>H NMR of 1-[10-(hydroxydecyl)]imidazole (2)

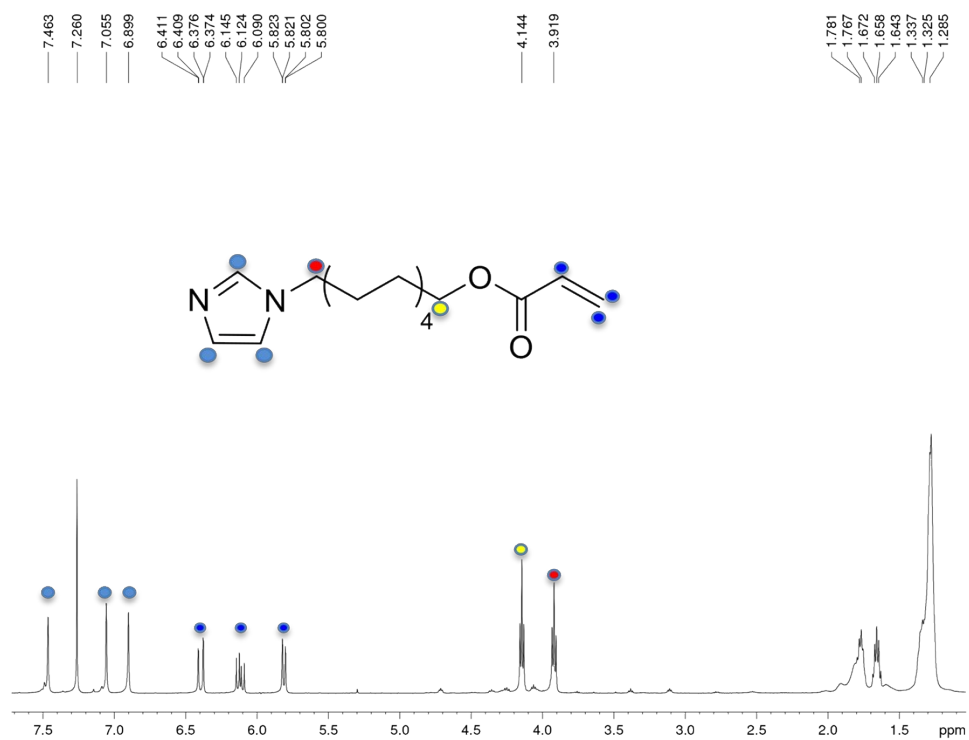


Figure S2.  $^1\text{H}$  NMR of 1-(10-(acryloyloxy)decyl)imidazole (3)

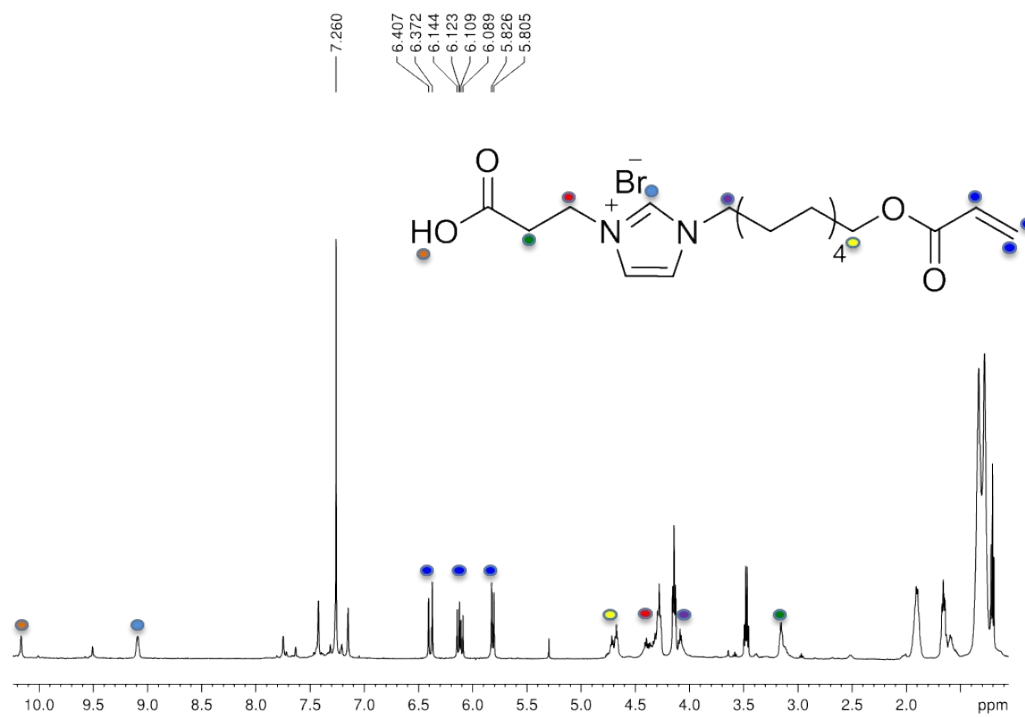
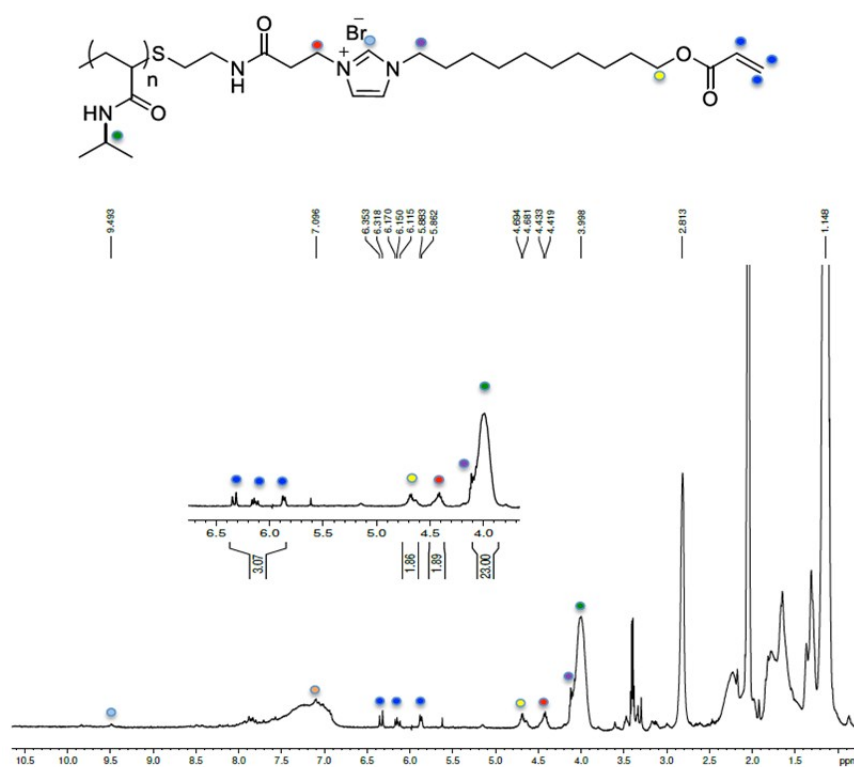
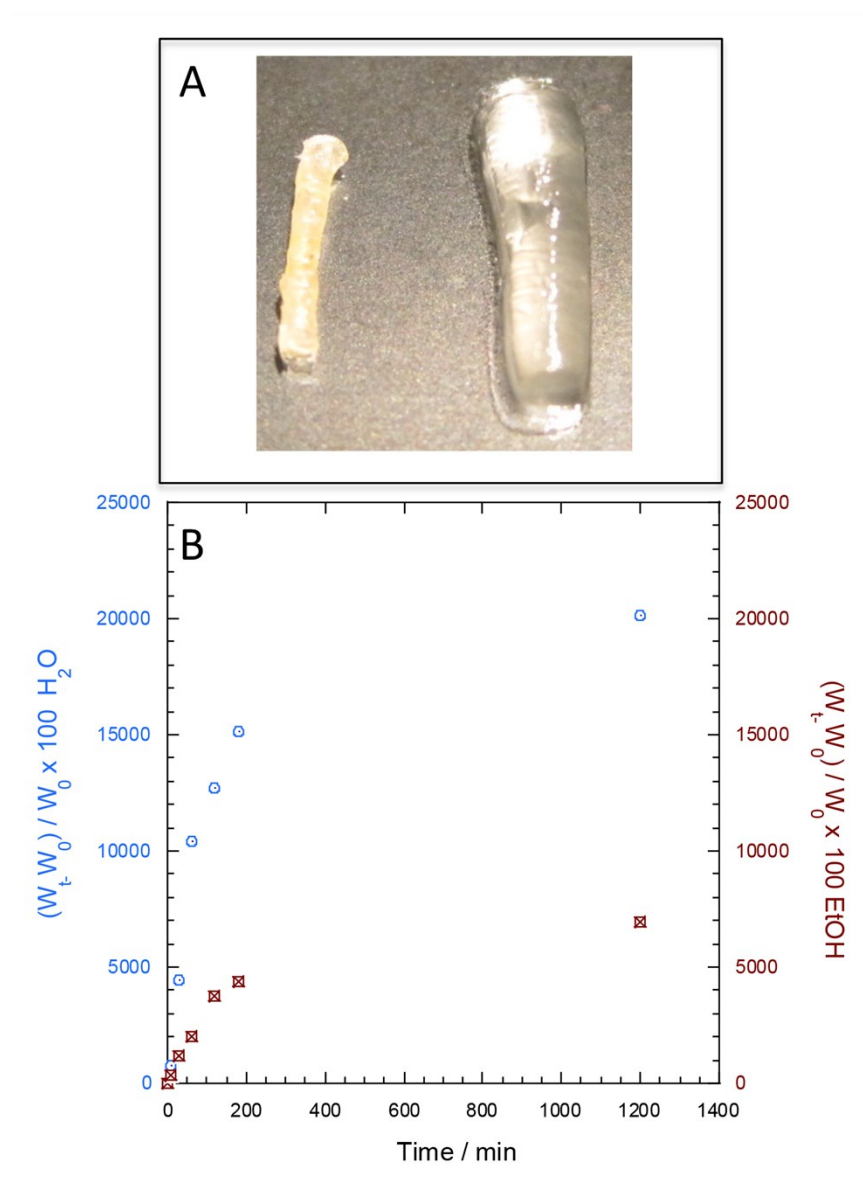


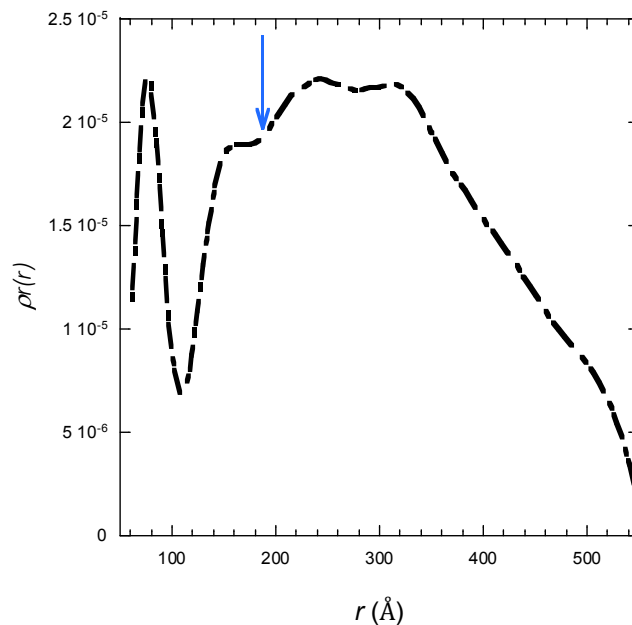
Figure S3. <sup>1</sup>H NMR of 1-(10-(acryloyloxy)decyl)-3-(2-carboxyethyl)imidazolium bromide (4)



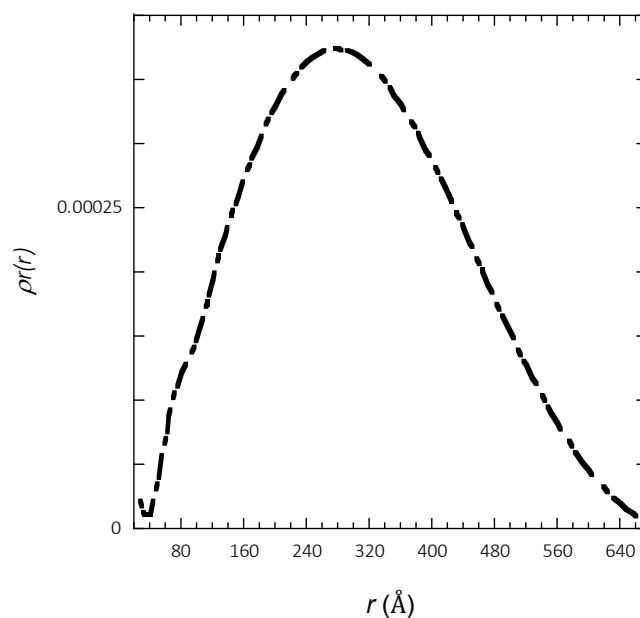
**Figure S4.** <sup>1</sup>H NMR of 1-(10-(acryloyloxy)decyl)-3-(2-carboxyethyl)imidazolium bromide-PNIPAM Conjugate (5)



**Figure S5.** Weight ratios as a function of time during water (blue) and ethanol (red) swelling of poly{(1-(10-(acryloyloxy)decyl)-3-(2-carboxyethyl)imidazolium bromide-graft-PNIPAM)-co-1-(10-(acryloyloxy)decyl)-3-methylimidazolium chloride}



**Figure S6A.** Pair distance distribution function, PDDF determined for water swollen poly[[C<sub>1</sub>COOHAcrc<sub>10</sub>IM]<sup>+</sup>[Br]<sup>-</sup> PNIPAM<sub>23</sub>]-co-[AcrC<sub>10</sub>mim<sup>+</sup>][Cl<sup>-</sup>] at 10 °C. The profile deviates from the bell-shaped curve, skewed towards long distances signaling a disk shape particle shape. The large oscillation at short distances is attributed to the high contrast between particle exterior – interior. The blue arrow indicates approximate disk thickness. Orange arrow gives estimation of particle size.



**Figure S6B.** Pair distance distribution function, PDDF determined for water swollen poly[[C<sub>1</sub>COOHAcrc<sub>10</sub>IM]<sup>+</sup>[Br]<sup>-</sup> PNIPAM<sub>23</sub>]-co-[AcrC<sub>10</sub>mim<sup>+</sup>][Cl<sup>-</sup>] at 50 °C. The profile deviates from the bell-shaped curve, skewed towards long distances signaling a disk shape particle shape.