

## Supplementary Material

### Self-assembly of supra-amphiphiles building block fabricated by $\beta$ -cyclodextrin and adamantane-based ionic liquid

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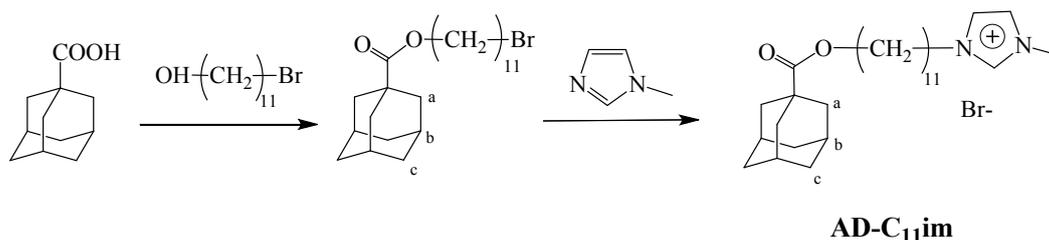
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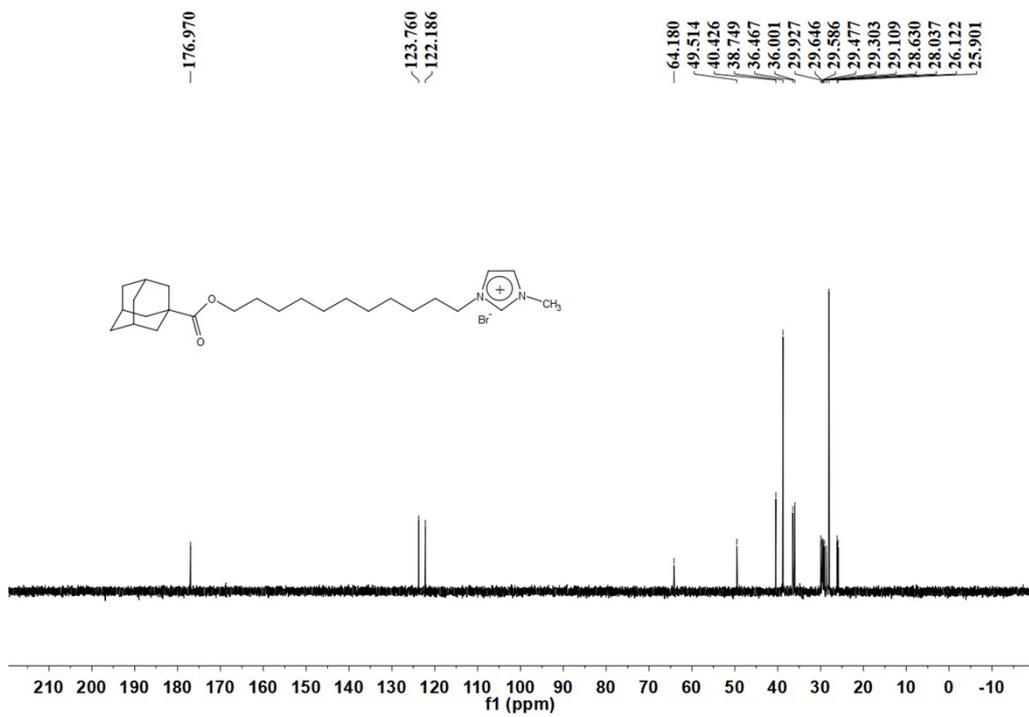
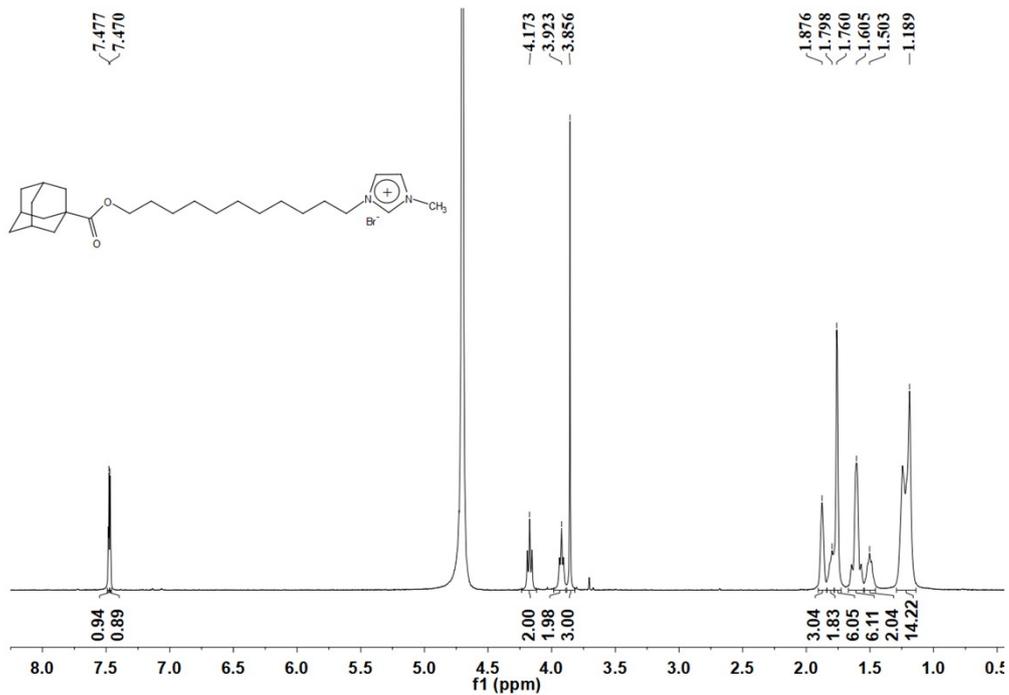
E-mail addresses: hezhou8@foxmail.com (C. Hu), yanxiaoweizb@163.com (X. Yan).

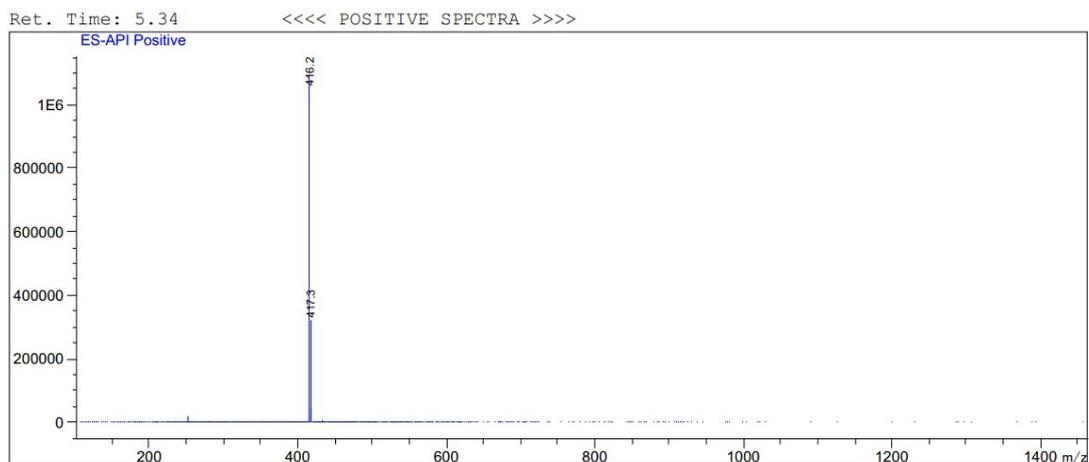
#### Synthetic process of AD-C<sub>11</sub>im

11-bromoundecyl adamantane-1-carboxylate (3.28 g) and 1-methylimidazole (0.99 g) were mixed in acetonitrile (60 mL) in a flask (250 mL), and the intermixture was refluxed with stirring for 48 hour. Then the obtained solution was condensed, cleaned with diethyl ether, and the crude product dissolved in methanol and dripped into diethyl ether (200 mL). Then pour out the ether layer and the remaining viscous liquids were washed twice with ethyl ether and dried to obtain the target surfactant AD-C<sub>11</sub>im.

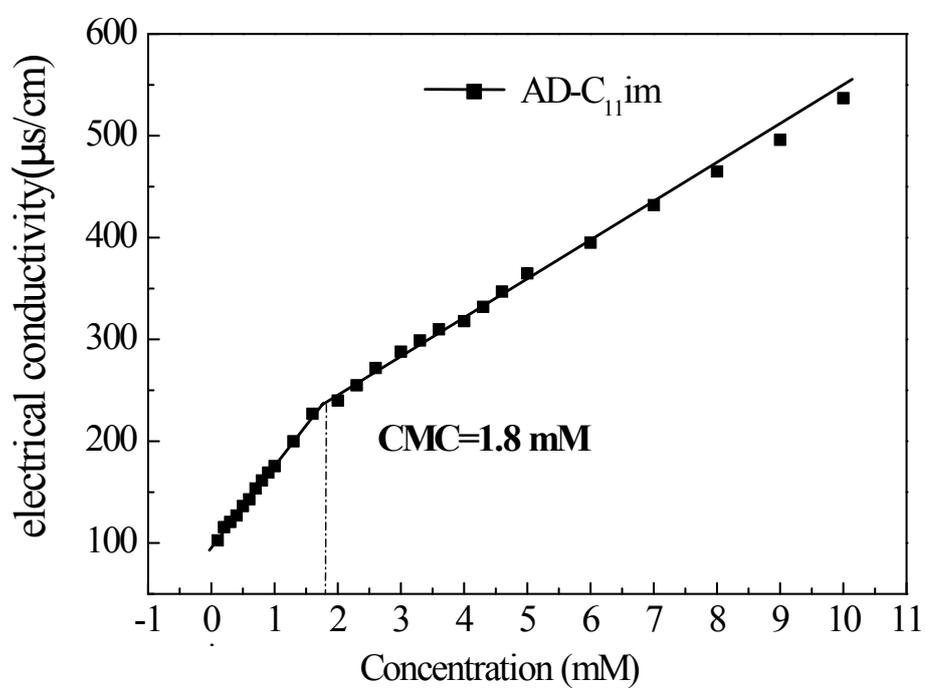


**Scheme S1.** The synthesis route of adamantane-based ionic liquid AD-C<sub>11</sub>im

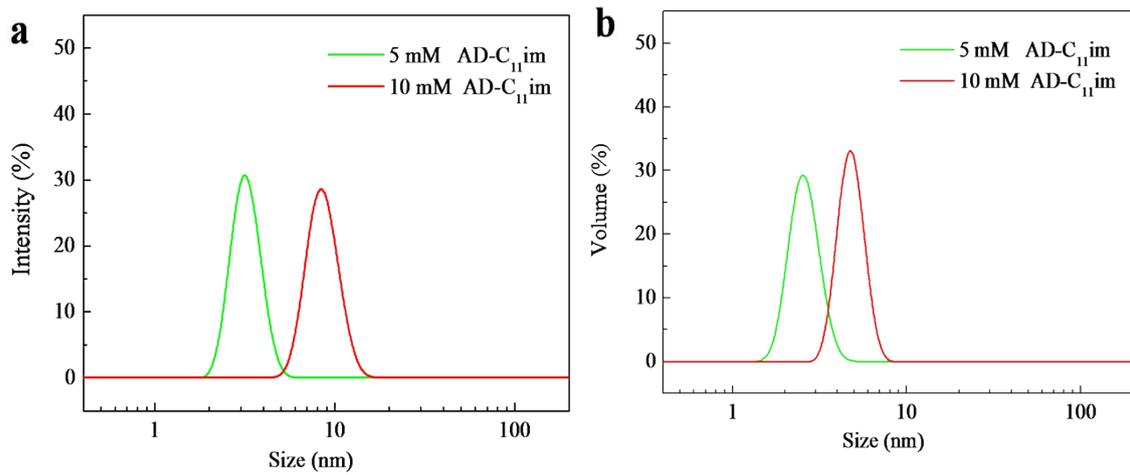




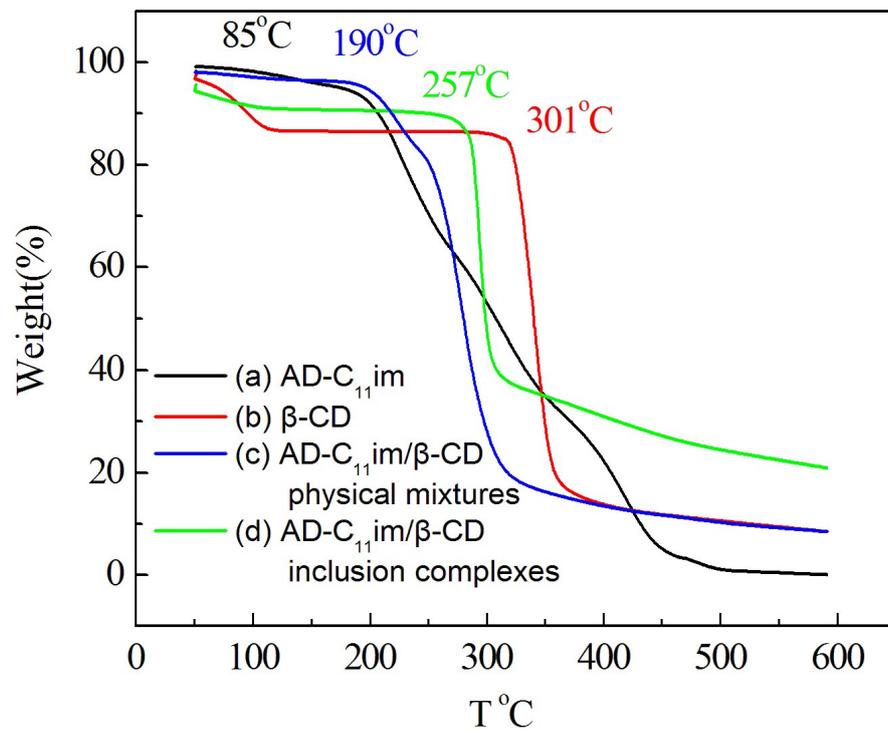
**Fig.S1.** The  $^1\text{H}$  NMR,  $^{13}\text{C}$  NMR and ESI-MS spectrum of AD-C<sub>11</sub>im



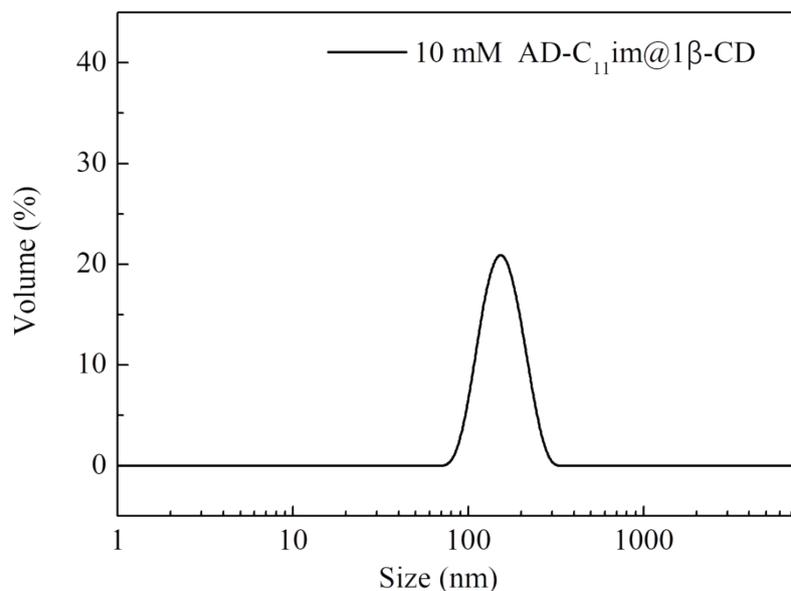
**Fig.S2.** Electrical conductivity curves of AD-C<sub>11</sub>im in aqueous solution at 25 °C.



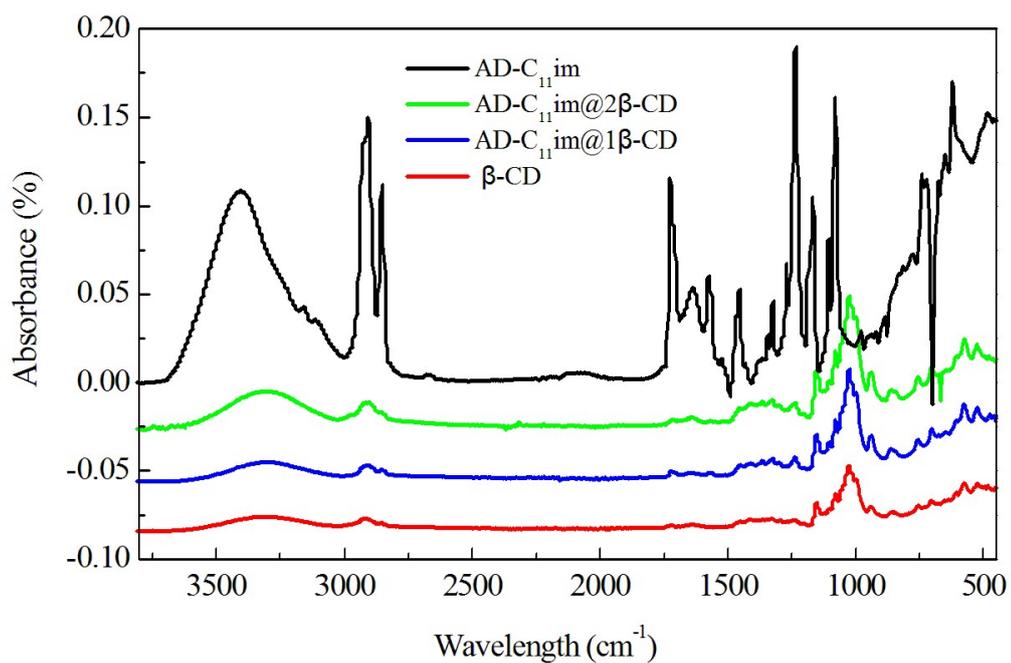
**Fig.S3.** The aggregate size distribution ((a) by scattering intensity, (b) by volume) of 5mM and 10 mM AD-C<sub>11</sub>im in aqueous solution.



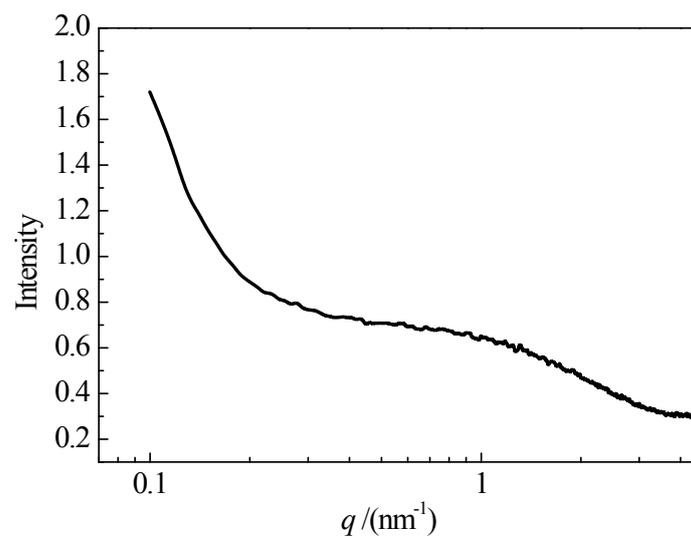
**Fig.S4.** TG curves of (a) AD-C<sub>11</sub>im, (b) β-CD, (c) AD-C<sub>11</sub>im/β-CD physical mixtures and (d) AD-C<sub>11</sub>im/β-CD inclusion complexes



**Fig.S5.** The aggregate size distribution (by volume) of 10 mM AD-C<sub>11</sub>im@1β-CD in aqueous solution



**Fig.S6.** FT-IR spectra with full wavenumbers for β-CD, AD-C<sub>11</sub>im, AD-C<sub>11</sub>im@1β-CD, AD-C<sub>11</sub>im@2β-CD.



**Fig.S7.** SAXS measurement for the AD-C<sub>11</sub>im@2β-CD at 30 mM.