

## Supplementary information

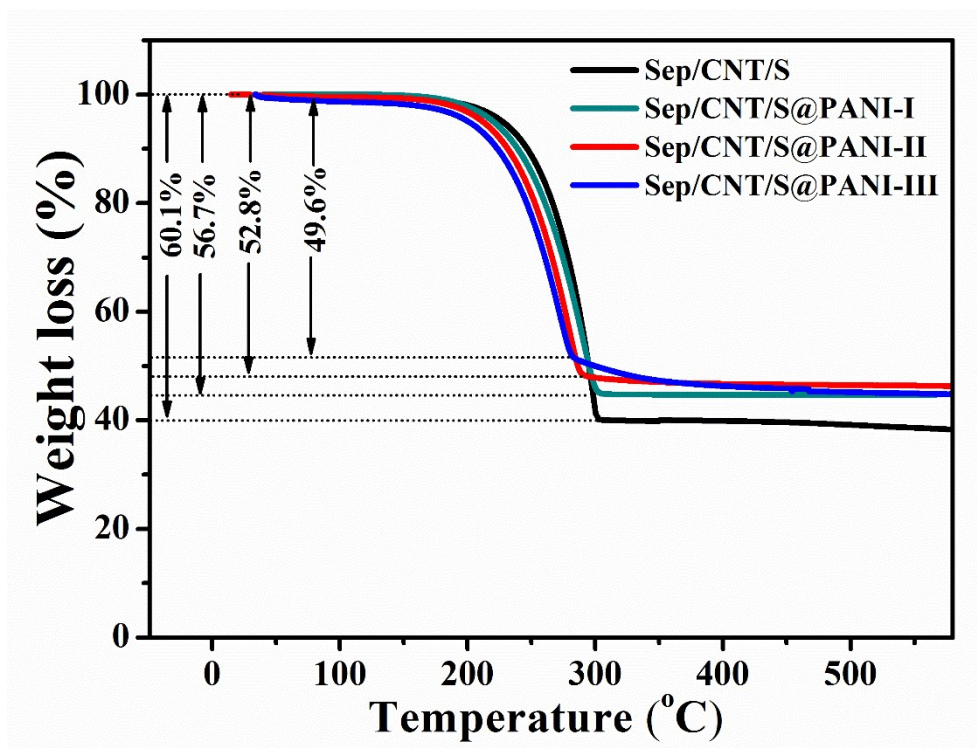


Fig. S1. Thermogravimetric curves of Sep/CNT/S composite and Sep/CNT/S@PANI-I, II and III composites.

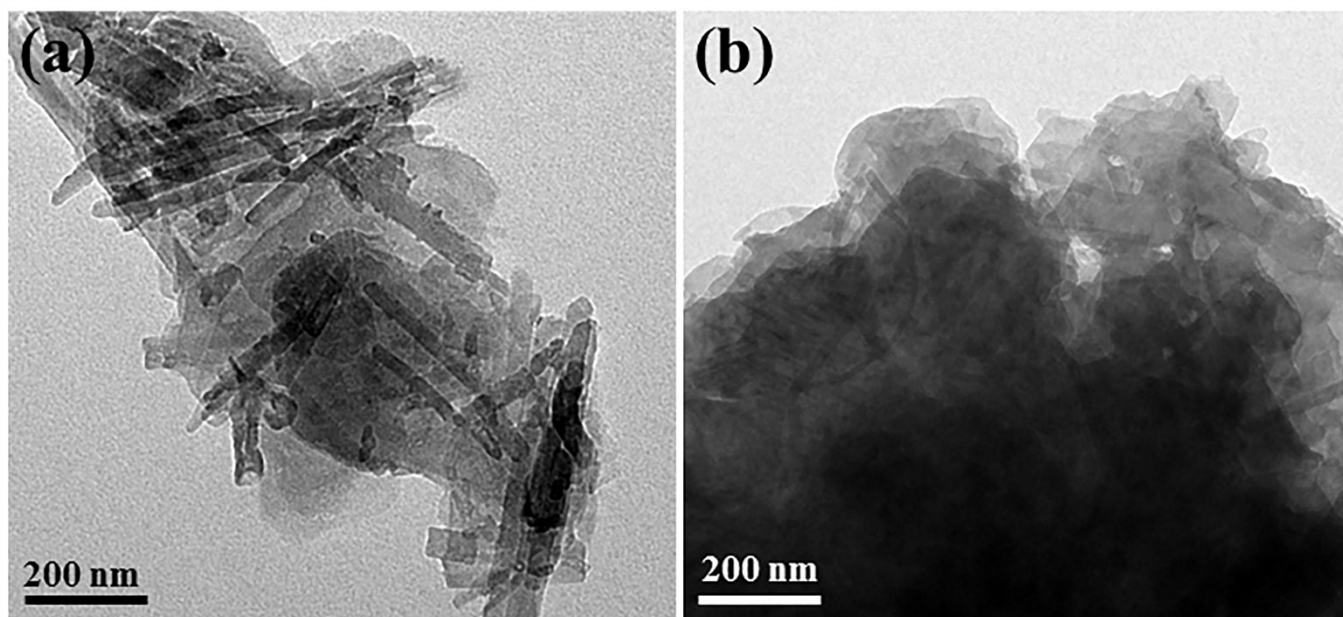
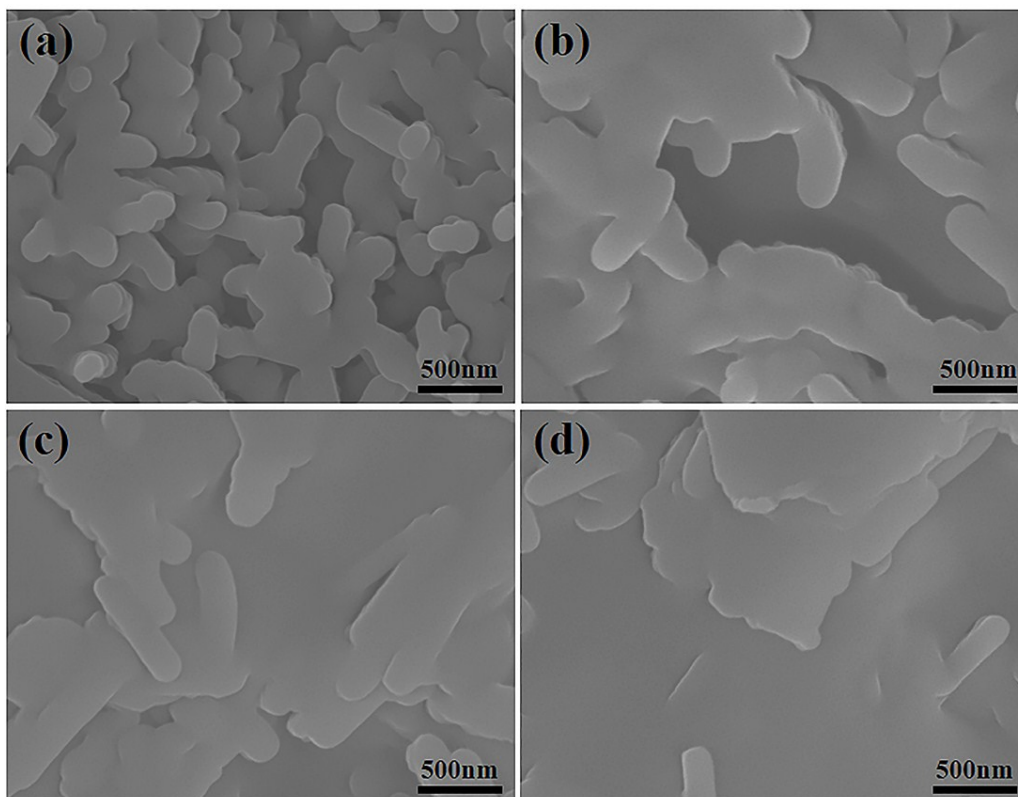


Fig. S2. TEM image of (a) Sep/CNT/S@PANI-I composite; (b) Sep/CNT/S@PANI-III composite.



**Fig. S3.** SEM image of (a) Sep/CNT/S composite and (b) Sep/CNT/S@PANI-I, (c) Sep/CNT/S@PANI-II and (d) III.

**Table. S1.** Impedance data derived using the equivalent circuit model for Sep/CNT/S composite and Sep/CNT/S@PANI composites before cycle and after 300 cycles.

<b>Before cycle</b>	<b><math>R_e</math> (<math>\Omega</math>)</b>	<b><math>R_{ct}</math> (<math>\Omega</math>)</b>
Sep/CNT/S	6.88	204.2
Sep/CNT/S@PANI (4:1)	6.71	166.2
Sep/CNT/S@PANI (2:1)	3.96	160.6
Sep/CNT/S@PANI (1:1)	4.89	148.7
<b>After cycle</b>	<b><math>R_e</math> (<math>\Omega</math>)</b>	<b><math>R_{ct}</math> (<math>\Omega</math>)</b>
Sep/CNT/S	4.91	89.8
Sep/CNT/S@PANI (4:1)	7.59	76.3
Sep/CNT/S@PANI (2:1)	7.81	39.4

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Sep/CNT/S@PANI (1:1)	7.02	72.8
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