

Supplementary Information

Emulsion-polymerized flexible semi-conducting CNCs-PANI-DBSA nanocomposite films

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Table S1. Onset degradation temperatures, obtained by TGA(a), of air-dried CNCs-PANI-DBSA nanocomposite films prepared at different DBSA:aniline molar ratios compared to PANI-DBSA.

| Sample ID | Mass ratio, CNCs:aniline | Molar ratio, DBSA:aniline | Onset degradation temperature (°C) | | |
|-----------|-----------------------------|------------------------------|------------------------------------|--------|--------|
| | | | A | B | C |
| A | 2 | 0.25 | 150.15 | - | - |
| B | 2 | 0.5 | 178.03 | 289.18 | 447.01 |
| C | 2 | 1 | 181.52 | 290.36 | 451.96 |
| D | 2 | 1.5 | 184.65 | 292.26 | 446.09 |
| E | 1 | 2 | 188.91 | 279.72 | 432.06 |
| F | 2 | 2 | 189.18 | 290.23 | 454.02 |
| G | 5 | 2 | 189.73 | 292.17 | 473.77 |
| PANI-DBSA | 0 | 1 | - | 289.47 | 424.32 |

^(a) TGA was measured for samples doped with HCl (1N) for 24 hours and dried at room temperature.

The onset degradation temperature, measured by TGA, for neat CNCs (H-form) was around 162°C.

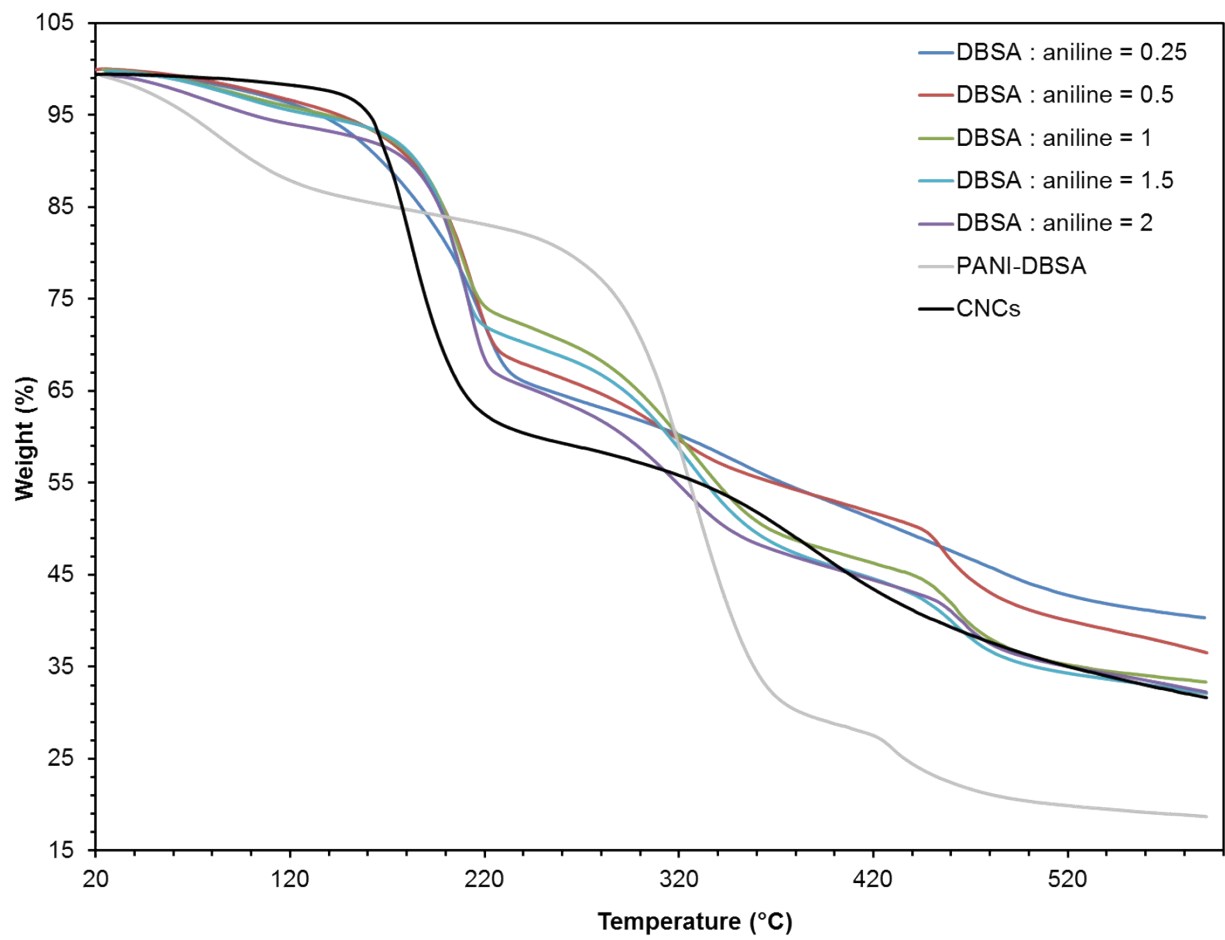


Figure S1. TGA curves of air-dried CNCs-PANI DBSA nanocomposite films compared to CNCs and PANI-DBSA.

Sample: SA-IV-88-B_DOPED
Size: 6.4310 mg
Method: Ramp

TGA

File: C:\...11-Doped\SA-IV-88-B_DOPED.001
Operator: SIHAM
Run Date: 19-Jun-2012 13:58
Instrument: TGA Q50 V6.5 Build 196

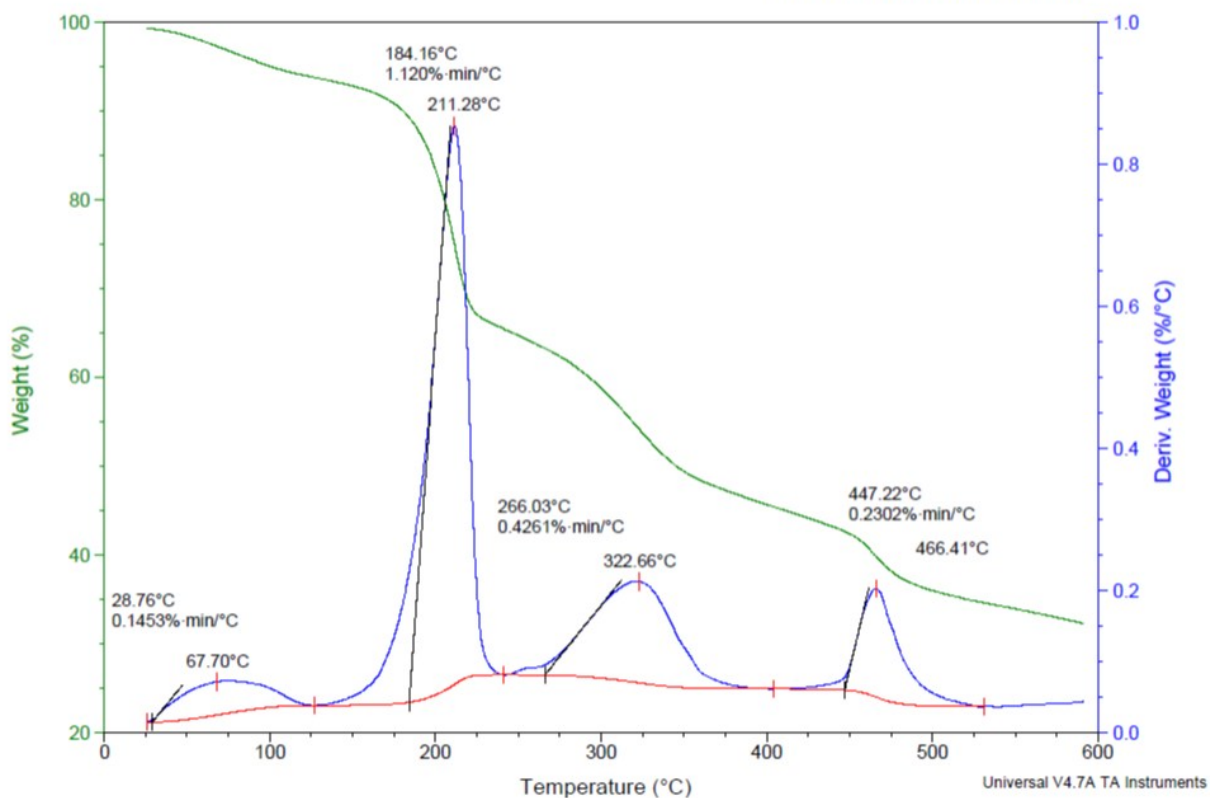


Figure S2. Integrals of areas under DTGA degradation peaks for a typical air-dried CNCs-PANI-DBSA nanocomposite film (molar ratio, DBSA:aniline=2 and mass ratio CNCs:aniline=2).

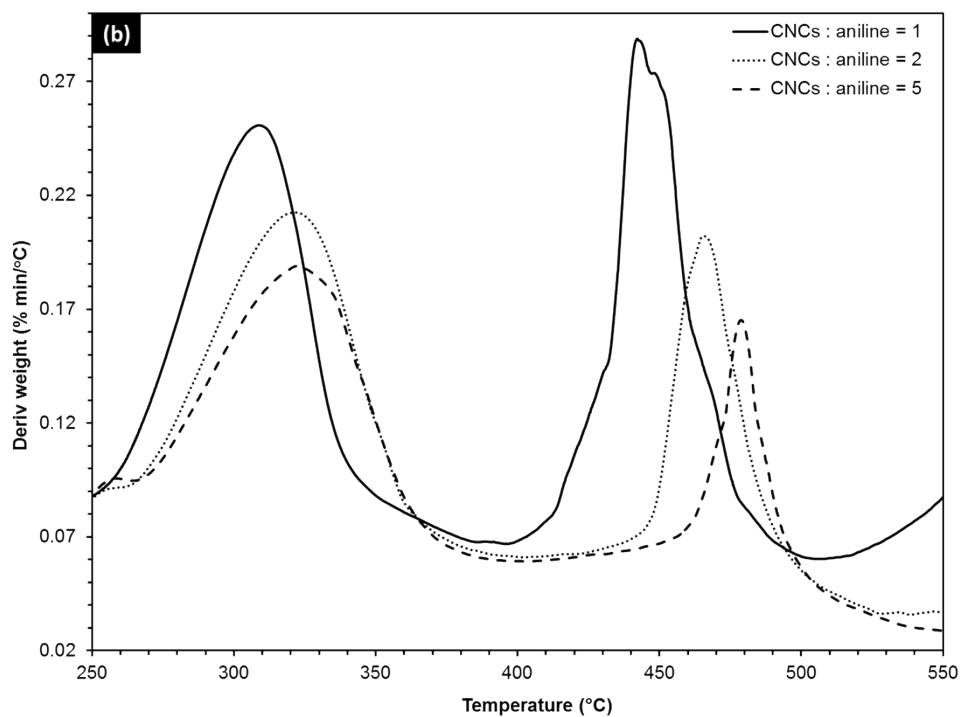
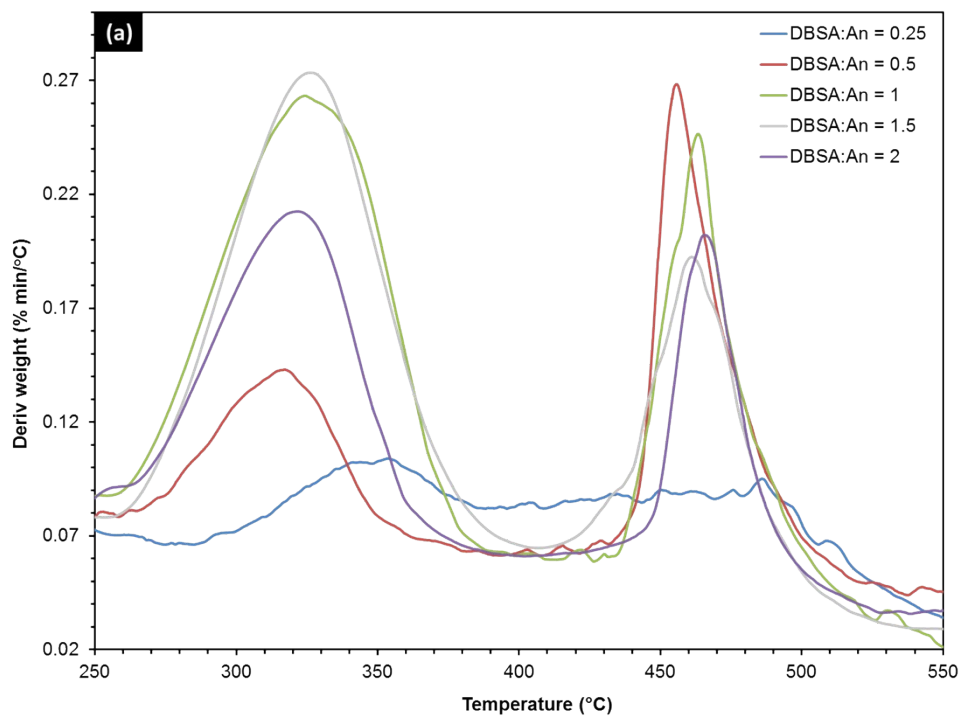


Figure S3. DTGA response curves, at onset degradation temperatures, illustrate the effects of DBSA (a) and CNCs (b) concentrations on polyaniline formation. The relevant onset degradation temperatures commence at 290°C, which is dominated by the degradation of excess DBSA and polyaniline oxidation, and at 420°C, dominated by the degradation of bound DBSA and the decomposition of the polyaniline backbone.