Electronic Supplementary Material (ESI) for RSC Advances.

Electronic structure of cyclodextrin-carbon nanotube composite films

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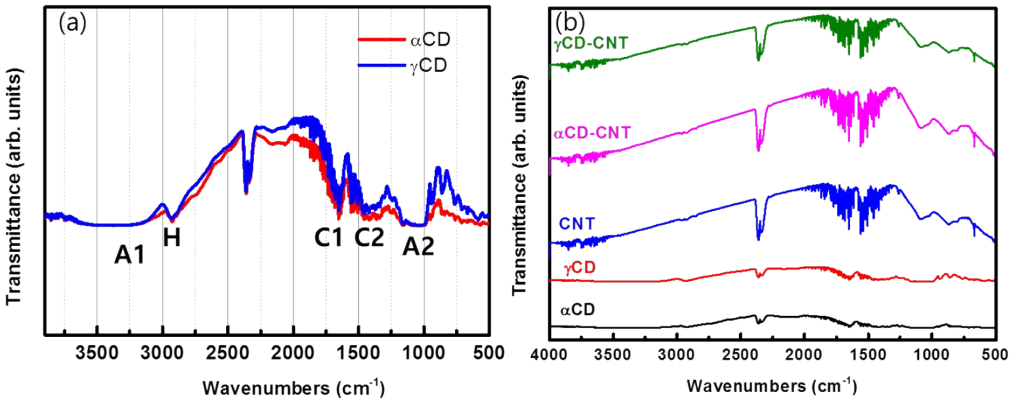

Fig. S1: A selection of the FTIR spectra of (a) αCD and γCD, and (b) stacked as a comparison with the reference cycldextrin IR spectra.

Fig. S1 (a) shows the Fourier transform infrared (FTIR) spectra of αCD and γCD. They are very similar. We can see the alcohol peaks near 3700 cm^{-1} (peak A1) and 1150-1050 cm^{-1} (peak A2). Peak A1 is from O-H stretch vibration of the alcohol, and peak A2 is due to C-O stretch vibration. Peak H refers C-H stretch vibration, and C1 and C2 present C=C stretch vibrations from alkene and aromatic, respectively. The FTIR spectra are more intense when the cyclodextrin is combined with the CNT, as shown in Fig. S1. The composite materials have stronger dipole oscillator strengths. The CNT has similar functional groups like CD because of partial oxidation and because of ambient contaminants that exhibit the characteristic alcohol peaks (Peak A1 and Peak A2), but not the characteristic CD IR absorption bands, belonging to the valence vibrations of the

C- H bonds in the CH and CH_2 groups at 2926 cm^{-1}.

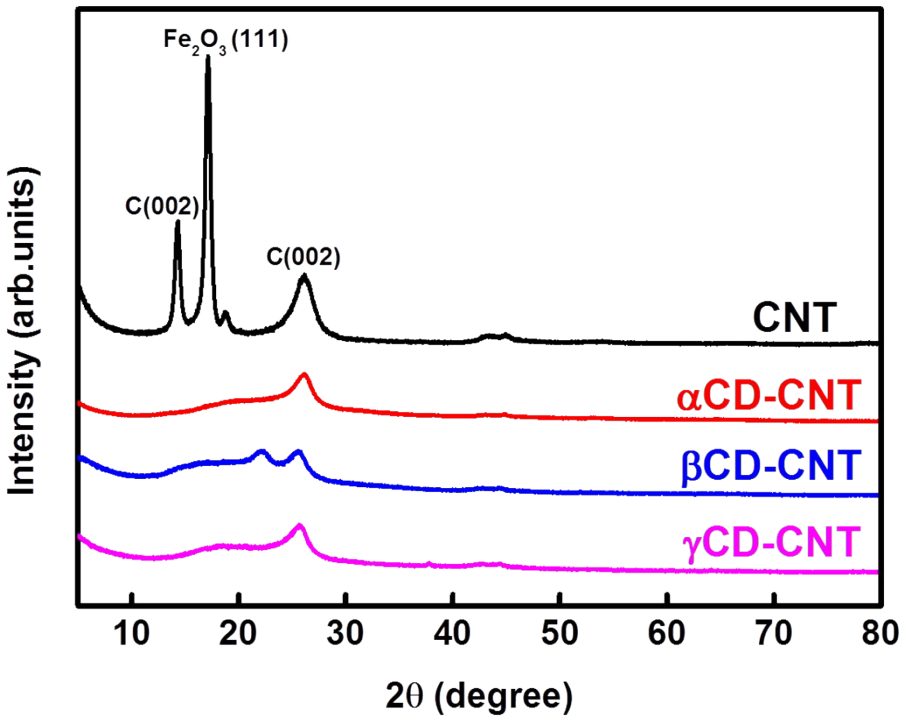

Fig. S2. XRD results of the samples.

The θ-2θ X-ray diffraction (XRD) results of the samples are illustrated. The CNT has the graphitic structure of (002) near 26 degree (1st order) and 15 degree (2nd order) with the indications of catalysts (Fe_2O_3) evident in the XRD results. The XRD spectra of the CD-CNT composites are similar because of the absence of cyclodextrin crystallinity. The additional diffraction lines associated with cyclodextrin, although broad, are evident.

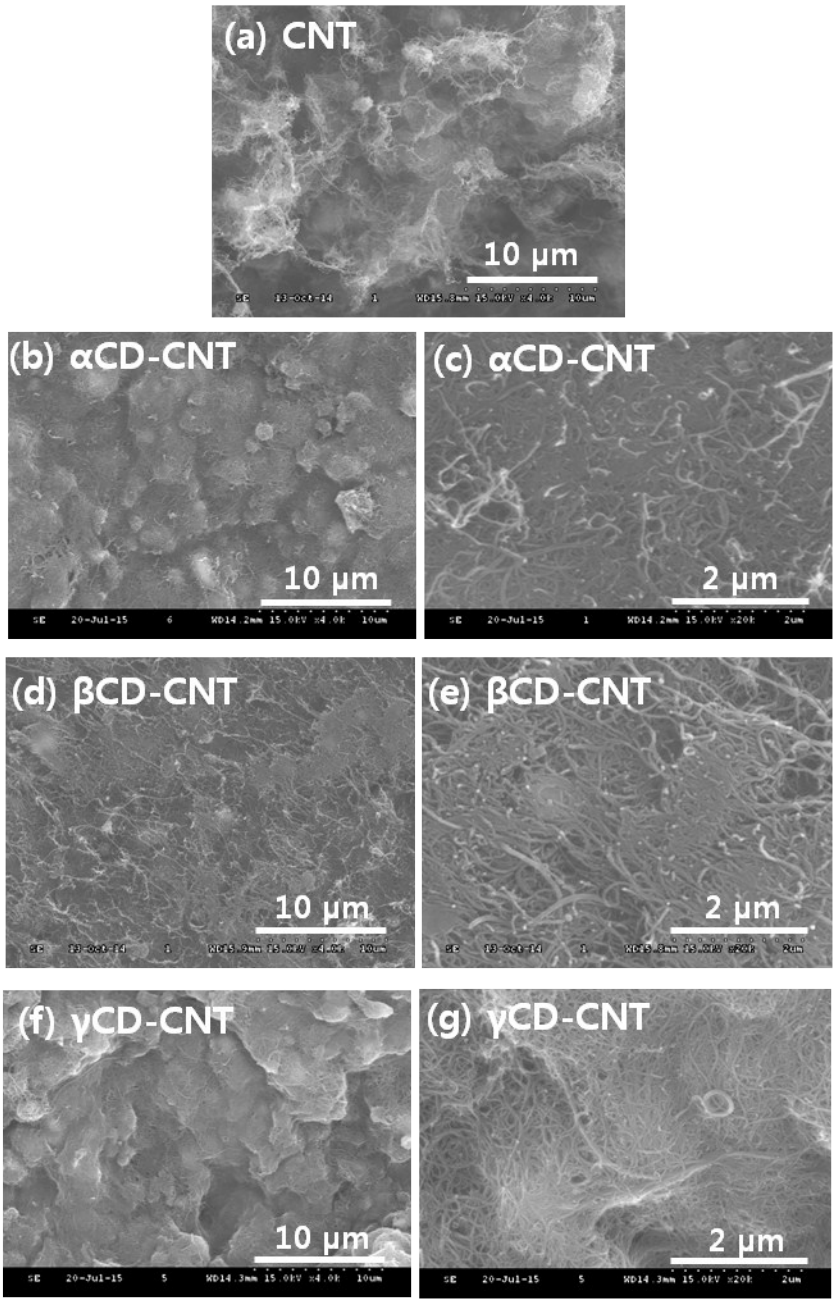

Fig. S3: The SEM images of CNT, αCD-CNT, βCD-CNT, and γCD-CNT composite films.

The SEM images permit identification of the strand-like one dimensional structure of CNT very well. When the αCD-CNT and γCD-CNT composite films are compared, more cyclodextrin is evident in the γCD-CNT composite film, as shown in Fig. S3(f) and (g).

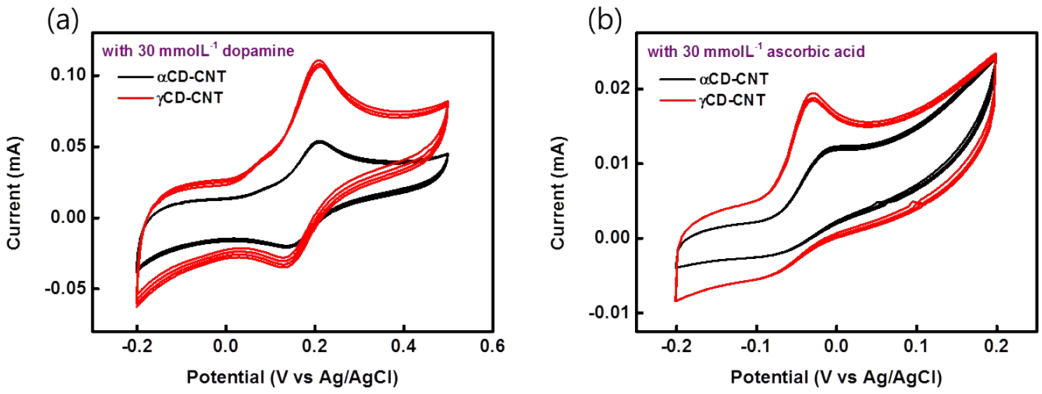

Fig. S4: The cyclic voltammetry (CV) results of the sample with (a) dopamine and (b) ascorbic acid.

The cyclic voltammetry (CV) results show that the currents measured for γCD-CNT are much higher than observed for αCD-CNT in the experiments with both dopamine and ascorbic acid.

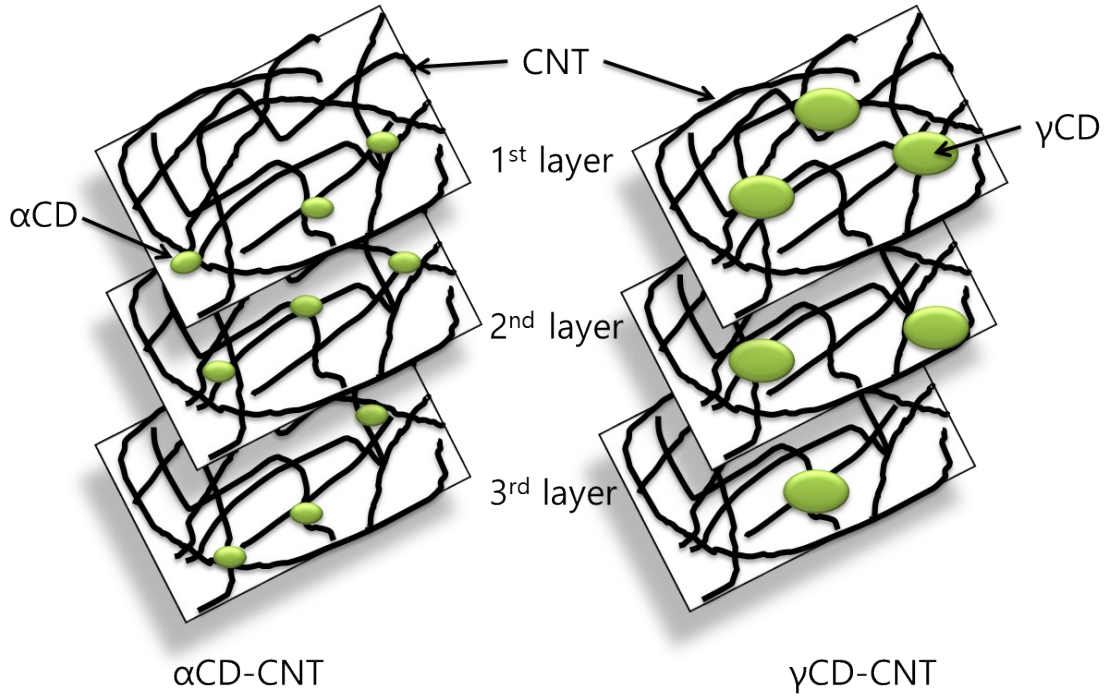

Fig. S5: A schematic of the αCD-CNT and γCD-CNT composite films.

Fig. S5 is a schematic of the composite films. The different size of cyclodextrin (CD) is indicated and the number of CD in each layer is suggested by the data (see main mauscript). The number of CD in each layer of the αCD-CNT is the same, at least with in the surface and selvedge region but is reduced (schematically represented by a reduction from three to one CD) in γCD-CNT. The latter occurs because of the bigger size of γCD.