Electronic Supplementary Material (ESI) for Chemical Science.

Supporting Information to

A Carbon-Carbon Hybrid – Immobilizing Carbon Nanodots and Carbon Nanotubes

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Structure

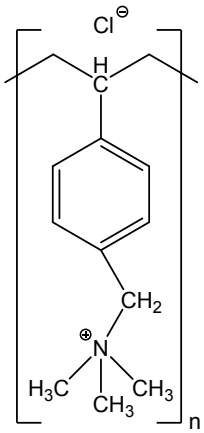

Figure S1. Structure of poly(4-vinylbenzyl trimethylamine) (PVBTA)

Steady State Absorption Spectroscopy

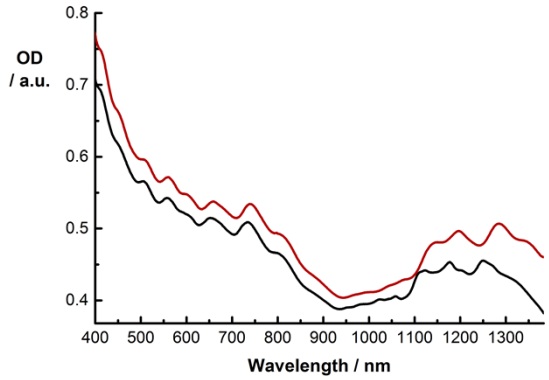

Figure S2. Absorption spectra of **HiPCO SWCNT** dispersed with SDBS (2wt%, black) and PVBTA (2wt%, red) in D_2O.

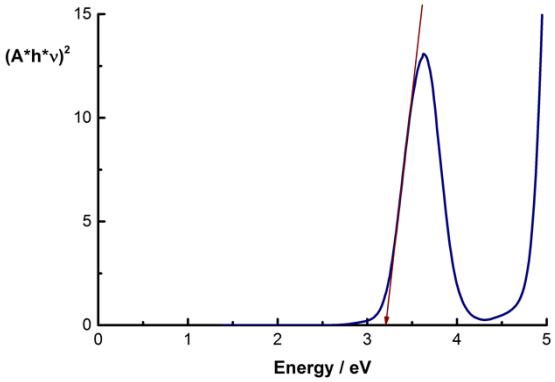

Figure S3. Tauc plot of **pCND** in H_2O.

Photoluminescence

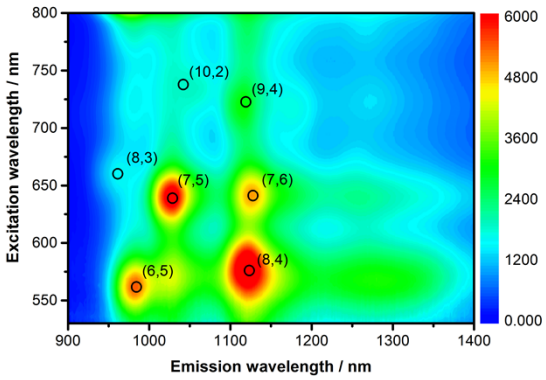

Figure S4. 3D-Photoluminescence plot of **CoMoCAT SWCNT/SDBS** in D_2O at room temperature with peak assignment.

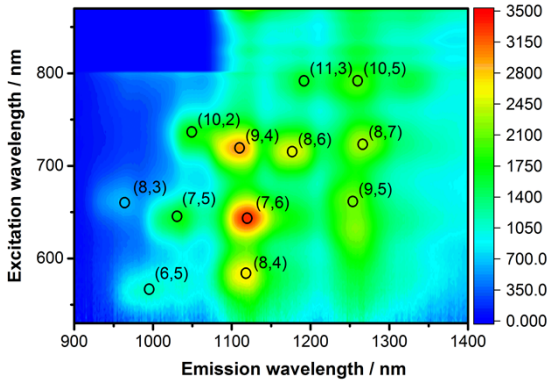

Figure S5. 3D-Photoluminescence plot of **HiPCO SWCNT/SDBS** in D_2O at room temperature.

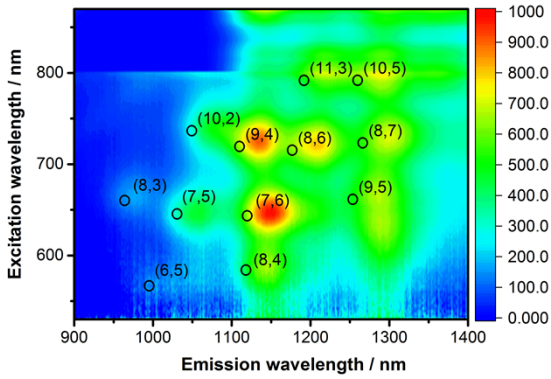

Figure S6. 3D-Photoluminescence plot of **HiPCO SWCNT/PVBTA** in D_2O at room temperature.

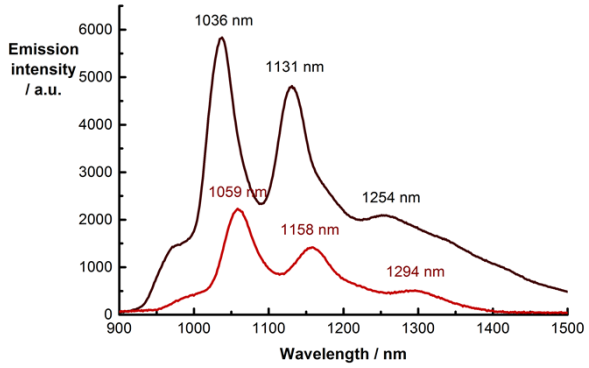

Figure S7. NIR emission spectra of dispersions of **CoMoCAT SWCNT/SDBS** (wine) and **CoMoCAT SWCNT/PVBTA** (red) with equal optical density at the 650 nm excitation wavelength in D_2O at room temperature.

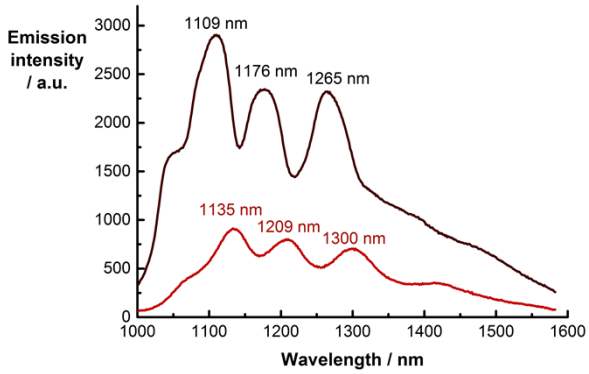

Figure S8. NIR emission spectra of dispersions of **HiPCO SWCNT/SDBS** (wine) and **HiPCO SWCNT/PVBTA** (red) with equal optical density at the 725 nm excitation wavelength in D_2O at room temperature.

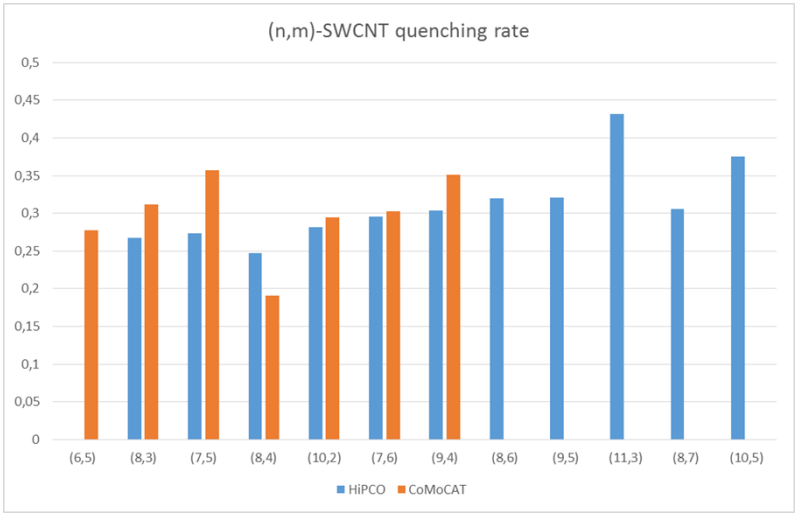

Figure S9. Quenching rates relative to the SDBS reference dispersions for the different SWCNT species present in **HiPCO SWCNT/PVBTA and** (blue) and **CoMoCAT SWCNT/PVBTA** (orange) dispersions.

Raman Spectroscopy

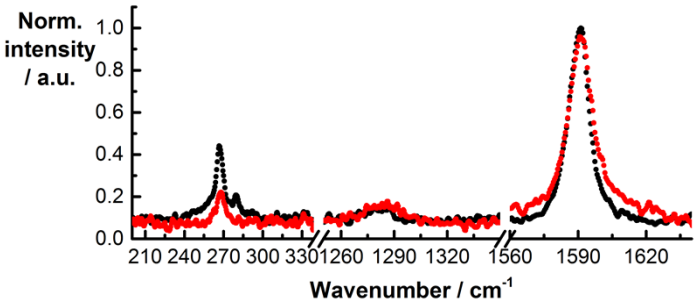

Figure S10. Normalized solid state Raman spectra (λ_{ex} = 1064nm) of **HiPCO SWCNT/SDBS** (black) and **HiPCO SWCNT/PVBTA** (red) with particular emphasis on the RBM- (left), D-band (center), and G-band (right) regions.

Transmission Electron Microscopy

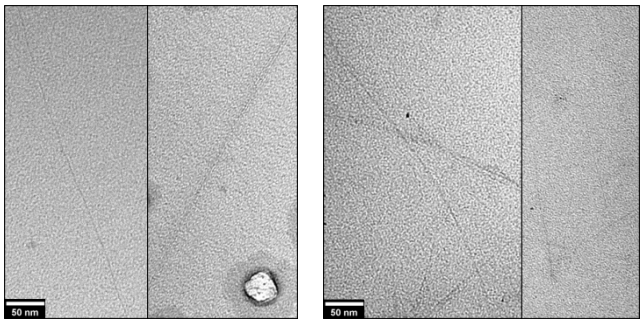

Figure S11. Representative TEM images of **CoMoCAT SWCNT/PVBTA** (left) and **HiPCO SWCNT/PVBTA** (right) on an ultrathin carbon support film.

Steady State Absorption Titrations

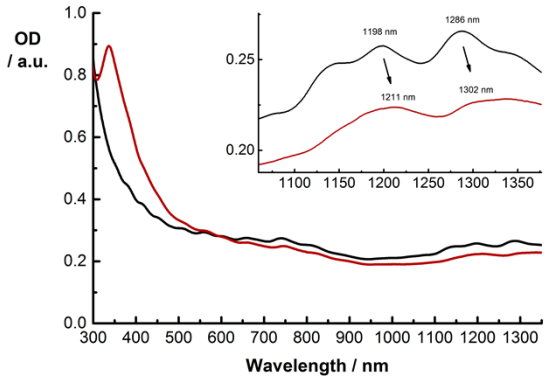

Figure S12. Absorption spectra of **HiPCO SWCNT/PVBTA** (black) and of **HiPCO SWCNT/PVBTA/pCND** (red) in D_2O at room temperature.

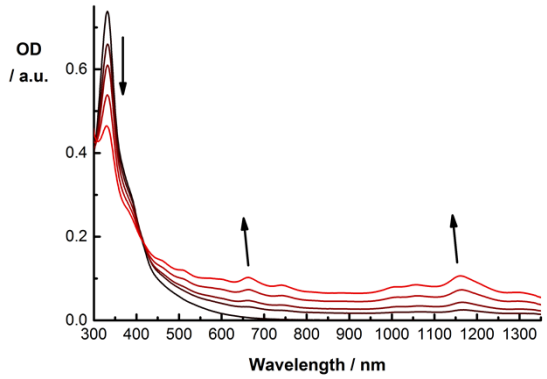

Figure S13. Absorption spectra recorded in the course of sequential addition of **pCND** to **CoMoCAT SWCNT/PVBTA** in D_2O at room temperature.

SWCNT Photoluminescence Quenching with pCND

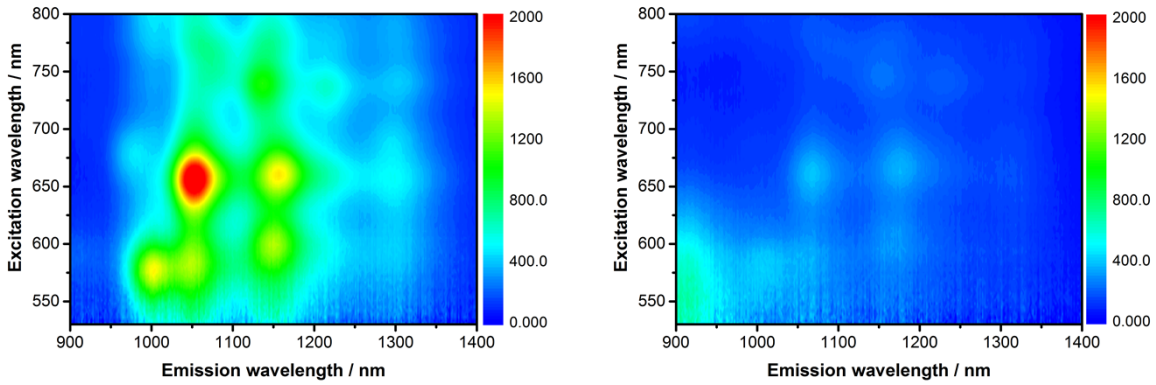

Figure S14. 3D-Photoluminescence plots of **CoMoCAT SWCNT/PVBTA** (left) and **CoMoCAT SWCNT/PVBTA/pCND** (right) in D_2O at room temperature.

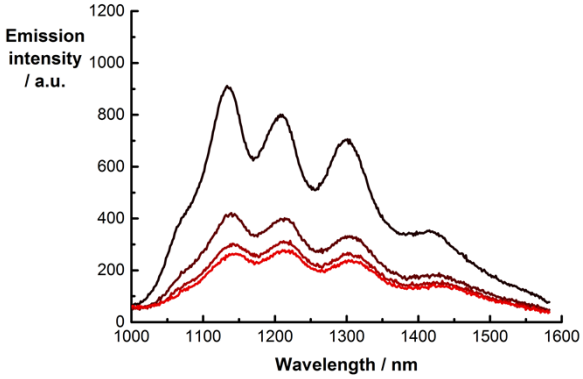

Figure S15. NIR emission spectra of **HiPCO SWCNT/PVBTA** upon excitation at 725 nm recorded during sequential addition of **pCND** in D_2O at room temperature.

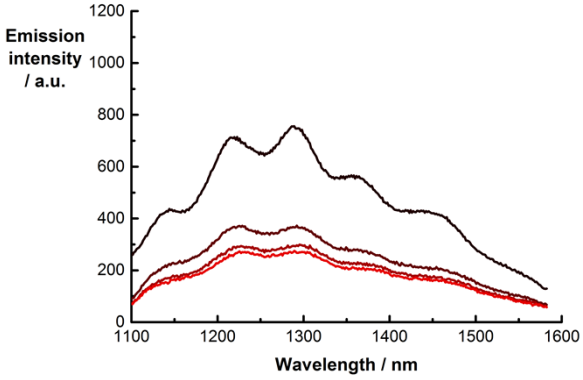

Figure S16. NIR emission spectra of **HiPCO SWCNT/PVBTA** upon excitation at 800 nm recorded during sequential addition of **pCND** in D_2O at room temperature.

Transmission Electron Microscopy of SWCNT/PVBTA/pCND

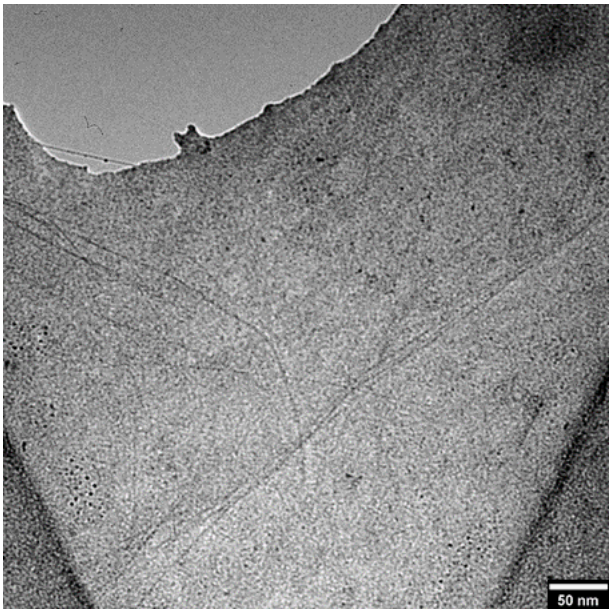

Figure S17. Representative TEM images of **CoMoCAT SWCNT/PVBTA/pCND** on an Lacey carbon support film.

Fluorescence Lifetime Measurements (TCSPC)

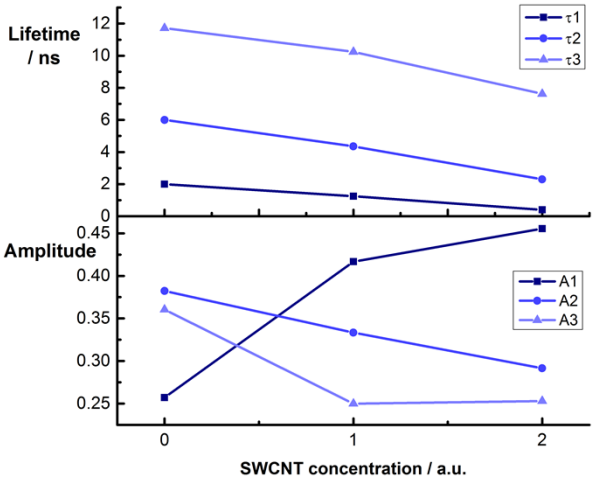

Figure S18. Evolution of the emission lifetimes and their corresponding amplitudes of **pCND** as a function of the amount of **CoMoCAT SWCNT/PVBTA** obtained by TCSPC. Samples were excited at 403 nm and time profiles were measured at 445 nm.

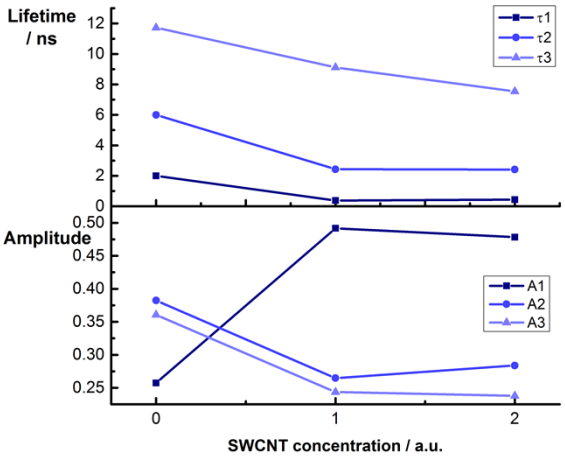

Figure S19: Evolution of the emission lifetimes and their corresponding amplitudes of **pCND** as a function of the amount of **HiPCO SWCNT/PVBTA** obtained by TCSPC. Samples were excited at 403 nm and time profiles were measured at 445 nm.

Steady State Emission Titrations

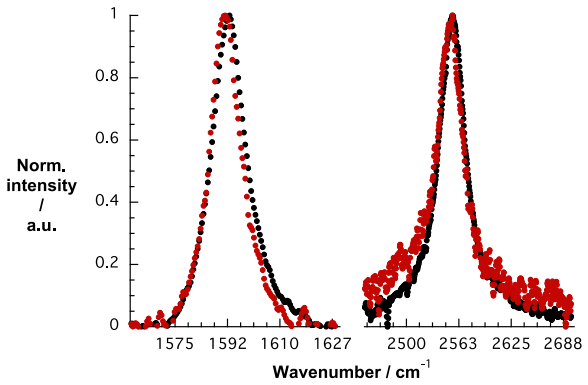

Figure S20. Normalized solid state Raman spectra (λ_{ex} = 1064nm) of **HiPCO SWCNT/PVBTA** (black) and **SWCNT/PVBTA/pCND** (red) with particular emphasis on the G-band and 2D-region.

Spectroelectrochemical Data (Absorption and Emission)

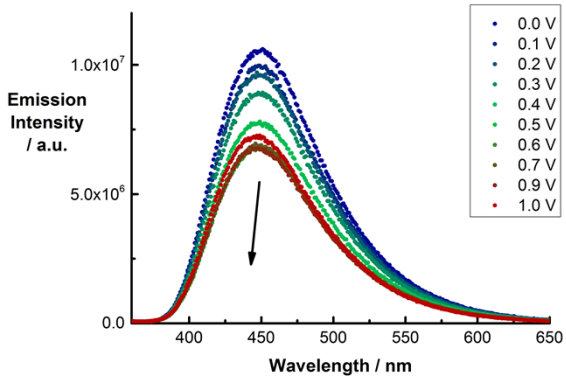

Figure S21: Emission spectra of **pCND** upon stepwise oxidation from 0 – 1 V in H_2O with 0.1 M $TBAPF_6$ as supporting electrolyte.

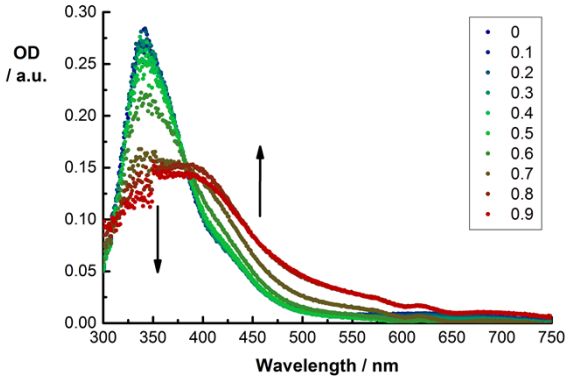

Figure S22: Absorption spectra of **pCND** upon stepwise oxidation from 0 – 1 V in H_2O with 0.1 M $TBAPF_6$ as supporting electrolyte.

Femtosecond Transient Absorption

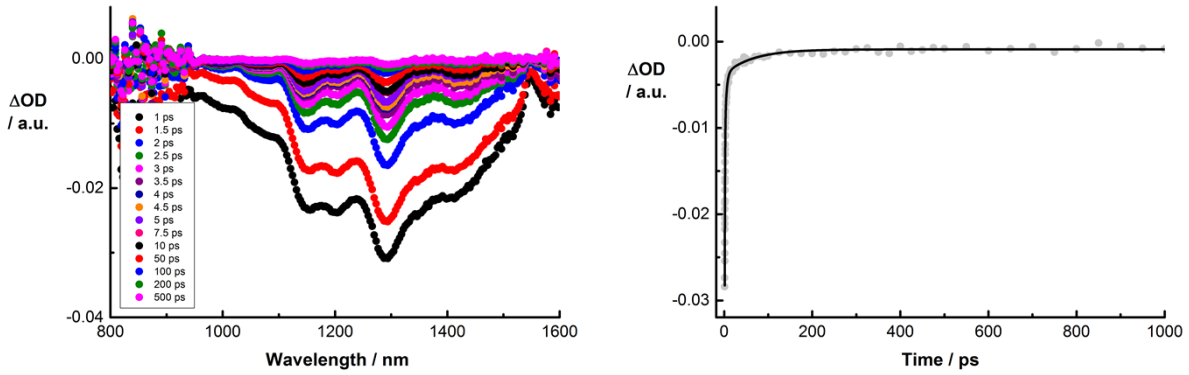

Figure S23. Left: Differential absorption spectra obtained upon femtosecond pump probe experiments (λ_{ex} = 387 nm) of **HiPCO SWCNT/PVBTA** with several time delays between 1.5 and 500 ps at room temperature. Right: Corresponding time absorption profile of the spectra shown on the left at 1300 nm monitoring the excited state decay.

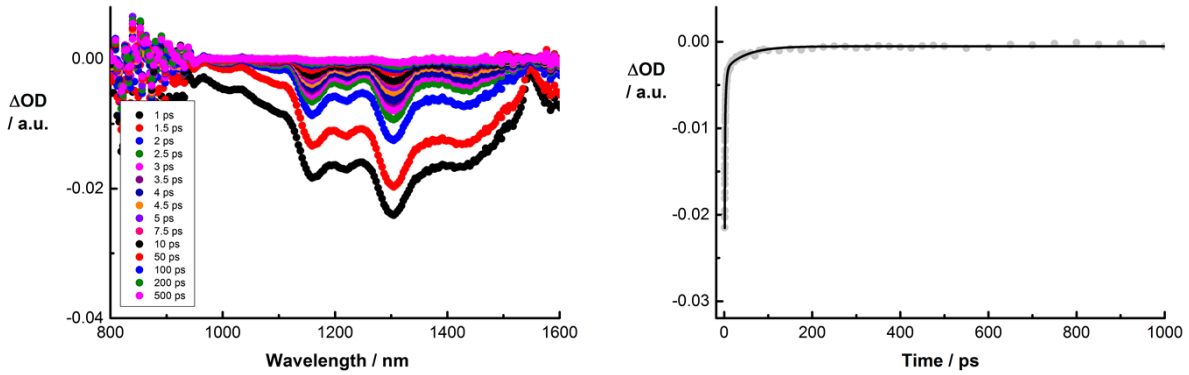

Figure S24. Left: Differential absorption spectra obtained upon femtosecond pump probe experiments (λ_{ex} = 387 nm) of **HiPCO SWCNT/PVBTA/pCND** with several time delays between 1.5 and 500 ps at room temperature. Right: Corresponding time absorption profile of the spectra shown on the left at 1300 nm monitoring the excited state decay.