Supporting Information

Optimizing dispersion condition of SWCNTs in aqueous solution of surfactants and organic solvents towards photovoltaic application

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1. Determination of dispersing ability of SDBS and DOC using UV-vis-NIR spectroscopy

The extractability of SDBS and DOC at different concentrations were calculated from the optical absorption spectroscopy by using Beer-Lambert law,

$$A = \alpha lc \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(a)}$$

Where, A is the absorbance, α is the extinction coefficient, l is the path length, and c is concentration. To determine the extinction coefficient, α, SDBS-SWCNT suspensions were prepared at very low concentration and made sure that the dispersion is quite well so that no precipitation is observed. To avoid precipitation, UV-vis-NIR spectra was recorded immediately after sonication and verified. The absorbance of these suspensions and the known initial concentration of SWCNTs, 0.05, 0.07, 0.09 and 0.11 mg/ml, were used to calculate the extinction coefficient. The absorbance values at the wavelength 850 nm were taken where no nanotube characteristic features are observed, and plotted as a function of SWCNT concentrations as shown in **figure S1(b)**.

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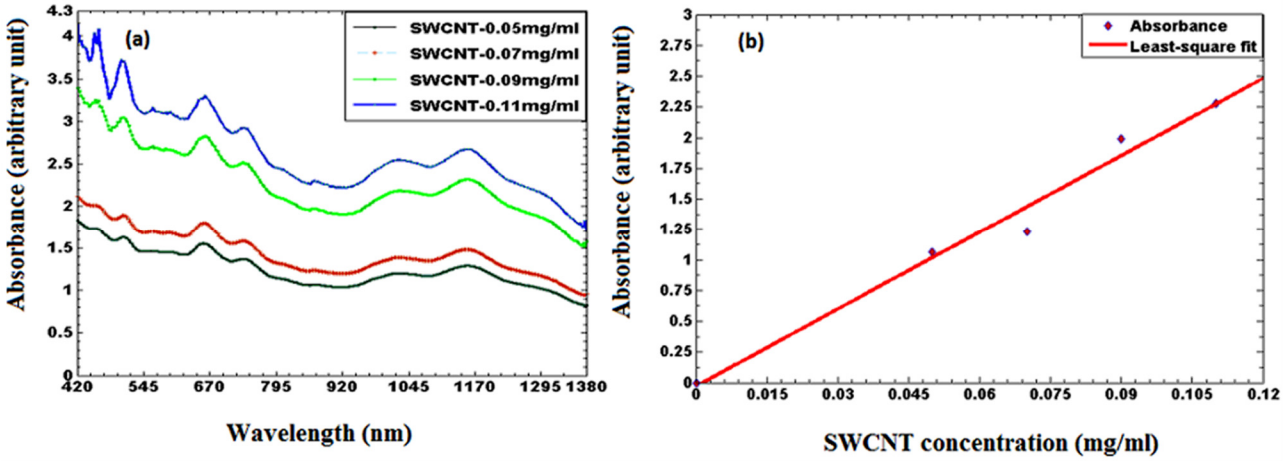

Figure S1 (a) Optical absorption spectra of the SWCNT suspension with various concentrations of surfactants, (b) Absorbance of the SWCNT suspension with SDBS at λ=850nm for different SWCNT concentrations.

From **figure S1 (b)**, the extinction coefficient is 2.0922 ± 0.02545 mL/mg.mm for SDBS and this value was used to calculate the concentration of SWCNTs in the suspension after dispersion for various surfactant concentrations. Extractability of the surfactants at different initial concentrations was calculated using the following relation,

$$\%\ extractability = \frac{x_1}{x} \times 100 \quad \text{..... ..... (b)}$$

Where, x_1 is the concentration of SWCNTs in the supernatant and x is the concentration of SWCNT originally taken in the surfactant. From the extractability, the optimum surfactant concentration for maximum nanotube exfoliation can be calculated.

UV-vis-NIR spectra of aqueous SWCNTs-surfactant mixture of varying surfactants concentration are provided in **figure S2**. And, UV-vis-NIR spectra of SWCNTs-organic solvent mixture with different sonication time are provided in **figure S3**.

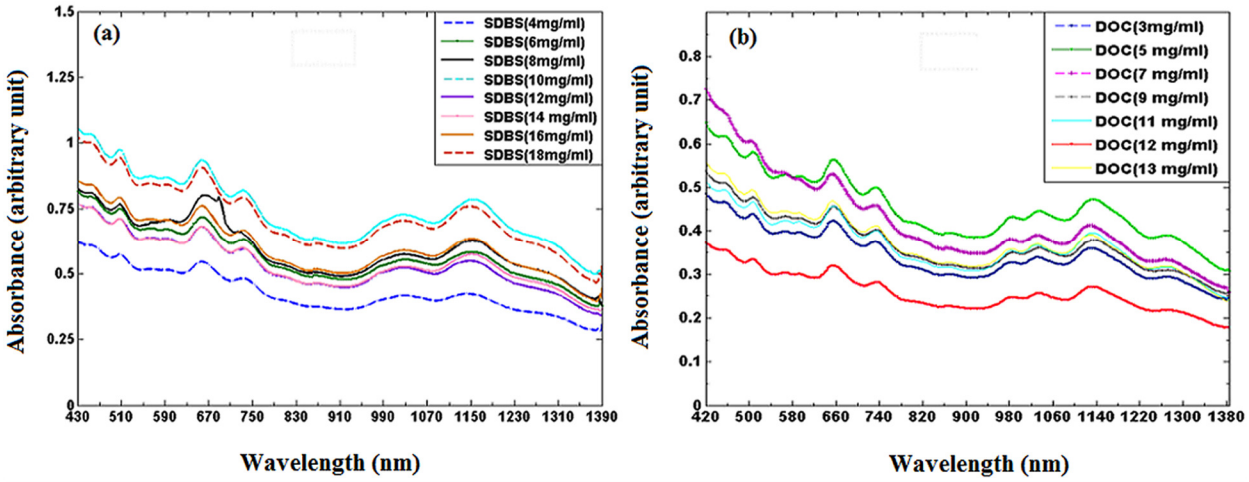

Figure S2 UV-vis spectra of SWCNTs in aqueous solutions of (a) SDBS and (b) DOC of different concentrations.

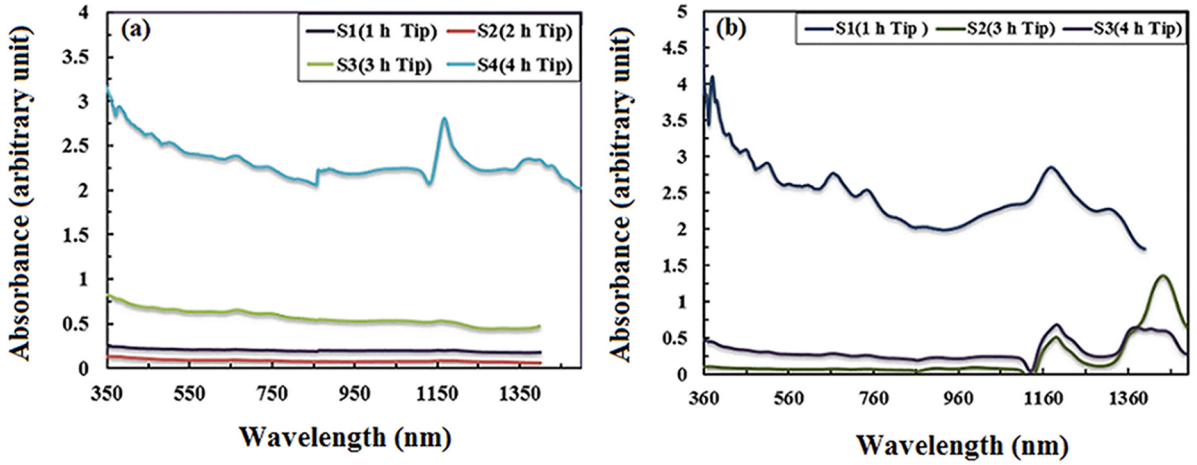

Figure S**Error! No text of specified style in document.** UV-vis-NIR absorption spectra of SWCNTs in (a) 1, 2-dichloroethane, and (b) in N,N-dimethylformamide solvent prepared under different sonication condition. In the case of the longer sonication time, the background absorption is reduced due to higher degree of exfoliation of SWCNTs.