# Filling of Single-Walled Carbon Nanotubes with Organic Molecules by Vapor Phase Infiltration

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Single-walled carbon nanotubes (SWCNTs) are known for their unique optical and electronic properties. Moreover, their nanometric size, combined with their tubular structure, enables quasi-one-dimensional confinement of molecules. The ability to confine molecules within nanotubes opens the way to synthesizing new materials with innovative properties. Common techniques for filling nanotubes with molecules include liquid-phase encapsulation[1] and vapor-phase encapsulation using a sealed ampoule[2]. However, these methods have drawbacks, such as the use of solvents that may interfere with the encapsulation of target molecules, as well as limited control over parameters such as temperature, pressure, and duration. My work aims to synthesize hybrid materials of the type molecules@nanotubes using a new vapor phase infiltration (VPI) method. VPI enables molecule encapsulation within nanotubes through sublimation, followed by a purge to remove unincorporated molecules, ensuring solvent-free and controlled synthesis. The study specifically examines the encapsulation of dicyanodistyrylbenzene (BDCS), an organic dye that exhibits enhanced fluorescence in its solid state. This effect, known as aggregation-induced enhanced emission (AIEE), arises from specific molecular stacking arrangements. Furthermore, encapsulating the dye within SWCNTs induces photosensitization of the nanotubes via energy transfer, highlighting potential applications in photoconversion.

## References

[1] Campo et al., ACS Nano, 19, 2021, 2301-2317.

[2] H. Kataura et al., Appl. Phys. A, 74, 2002 349-354.

## Figures

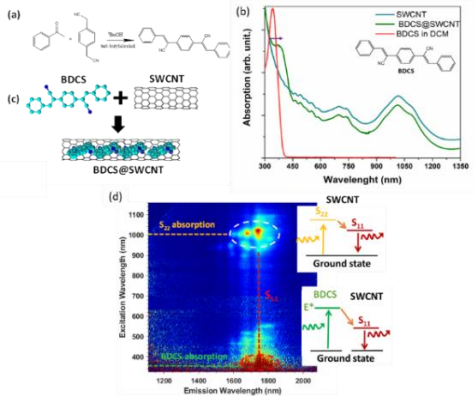


**Figure 1 :** (a-b) Schematic view of dicyanodistyrylbenzene synthesis and it's encapsulation (c) UV-VIS absorbance of the BDCS in solution and encapsulated in SWCNT (d) PLE map of the hybrids BDCS@SWCNT