

# Redispersion and Self-Assembly of C<sub>60</sub> Fullerene in Water and Toluene

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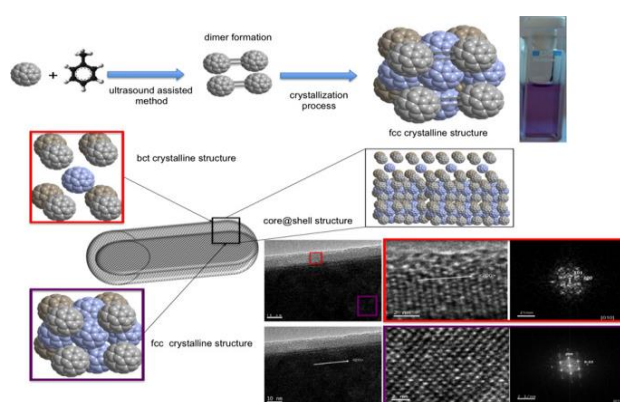
## Abstract

This work aims at assessing the influence of two different solvents, bidistilled water and toluene, on dispersions of carbon-based engineered nanomaterials, fullerenes, and their self-assembly behavior. The obtained self-assembled carbon-based materials were characterized using UV-vis spectrophotometry and transmission electron microscopy techniques. The results obtained were unexpected when toluene was used for dispersing fullerene C<sub>60</sub>, with the formation of two different types of self-assembled structures: fullerene C<sub>60</sub> nanowhiskers (FNWs) and a type of quasispherical nanostructure. The FNWs ranged between 1 and 6 μm in length, whereas the quasispherical fullerene C<sub>60</sub> nanoaggregates ranged between 10 and 50 nm in diameter [1]. Aggregates obtained in toluene showed a well-formed crystal structure. When using water, the obtained aggregates were amorphous and showed a no well-defined shape. Their sizes ranged between 20 and 40 nm for nanosized structures and between 0.4 and 4.8 μm for micron-sized self-aggregates. Previous work [2] underlined that C<sub>60</sub> shows very low solubility in water, whereas the solubility of C<sub>60</sub> in toluene is 2.8 mg/mL, which is an important factor to take into account in our experiments and in further studies [3].

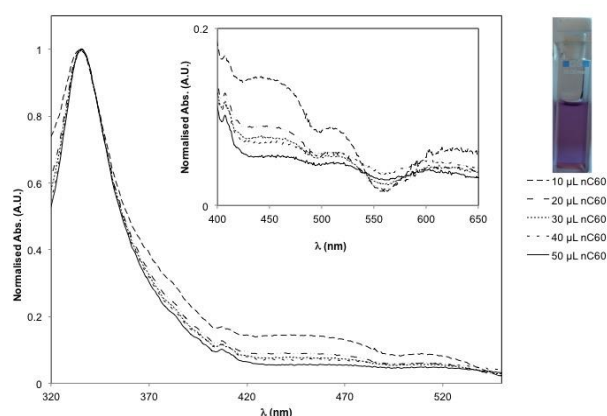
## References

- [1] Cid, A. et al., ACS Omega, 2 (2017), 2368–2373.
- [2] Hughes, J.B. et al., Environ. Sci. Technol. 39 (2005), 4307–4316.
- [3] Sukant, K. T. et al., Chem. Mater. 10 (1998), 2058–2066.

## Figures



**Figure 1:** Graphical abstract: dimer formation of FC<sub>60</sub> redispersed in toluene, core-shell structure formation of FNWs, TEM, HRTEM images, growth indexes confirming fcc and bct crystalline structures.



**Figure 2:** UV-vis normalized absorbance spectra of fullerene C<sub>60</sub> in toluene at several concentrations. Inset: Enhanced image of the peak found at 407 nm. Naked-eye observation of C<sub>60</sub> redispersed in toluene.

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