Functionalizing nanotubes with molecular switches for smart and sensitive devices

Silvia Giordani, Elisa Del Canto, Kevin Flavin, Manuel Natali

School of Chemistry/Centre for Research on Adaptive Nanostructures and Nanodevices (CRANN),
Trinity College Dublin, Dublin 2, Ireland.
e-mail: giordans@tcd.ie

Extensive studies on task-oriented molecules such as molecular switches have demonstrated that signals can be processed at the molecular level with designed transduction protocols.[1] These findings suggest that similar principles can be exploited to operate solid-state devices incorporating molecular components. Carbon nanotubes display unique structures and remarkable physical properties and are promising candidates for the realization of smart nanomaterials. They have nanoscale dimensions, and can be modified through covalent bonding of functional organic molecules, opening the way to structural materials of high technological importance.[2] In our research program we design, synthesize and characterize spiropyran-based photo switchable molecules[3] and we couple them onto single-walled carbon nanotubes in order to obtain smart modular materials. The chemical complexity of the systems means that a range of complementary techniques must be employed order to provide a complete picture of the composition and performance of the nanomaterials. We use an array of techniques such as thermal gravimetric analysis, FT-IR, micro-Raman, vis-NIR absorption and emission spectroscopy and atomic force microscopy.[4]

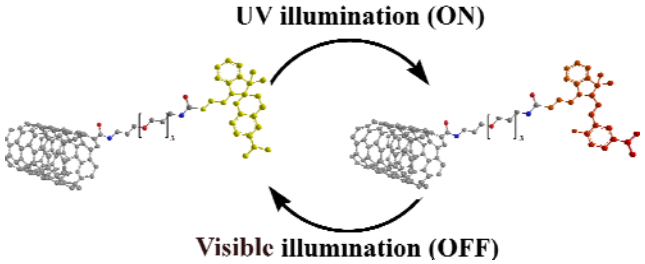

Figure: Schematic representation of on-off switching of SP-SWCNT.

References

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