

<b>Title</b>	<b>Synthesis, processing, and implementation of water-dispersible multi- and single-walled carbon nanotubes for electronic devices</b>
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<b>International Secondment</b>	
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# months (min.3)	6

**Project description (2 page max):**

Nowadays, low-dimensional materials are gaining great attention in the scientific community due to their unique properties, such as optoelectronic features, outstanding aspect ratio, lightweight, chemical versatility etc. [1]

This PhD thesis is focused on the extensive use of single and multi-walled carbon nanotubes (SWCNTs and MWCNTs, correspondingly), whose backbone has been properly modified to make them easily dispersible in aqueous solution (WD-SWCNTs and WD-MWCNTs).[2] For instance, organic syntheses are already under investigation to modify the surface of such CNTs by adding hydrophilic moieties like sulfonates, amines etc. These pendant groups do not only turn a hydrophobic pristine CNT into a hydrophilic one, but they also allow further chemical changes, which can confer additional functionalities as pollutant harvesting, host-guest pairing etc.

Among the relevant features of WD-SWCNTs and WD-MWCNTs, one of particular interest is the capability to transport charge carriers. As a result, it is well established that MWCNTs feature a metallic behaviour, on the contrary SWCNTs with specific structures show a semiconducting one.[3] For this reason, such materials are already a matter of study in electronics as active materials in different devices such as supercapacitors, transistors, resistors etc.[4]

Here, the project aims at developing well-suited hybrid materials based on either WD-SWCNTs or WD-MWCNTs as fillers, in a biocompatible matrix such as alginate, polyvinyl alcohol, poly lactic-co-glycolic acid. These smart scaffolds are a matter of investigation towards nerve/tissue repair.[5]

The resulting materials will be processed to obtain relevant components in electronics such as resistors, primers for electrodes and active materials for electrolyte-gated transistors (EGTs).[6]

## References

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- [4] R. Maheswaran et al. “A Critical Review of the Role of Carbon Nanotubes in the Progress of Next-Generation Electronic Applications” 2022, Journal of Electronic Materials, 51, 2786-2800
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