Electric-field-assisted self-assembly of nanohybrids for (bio)chemical sensing application

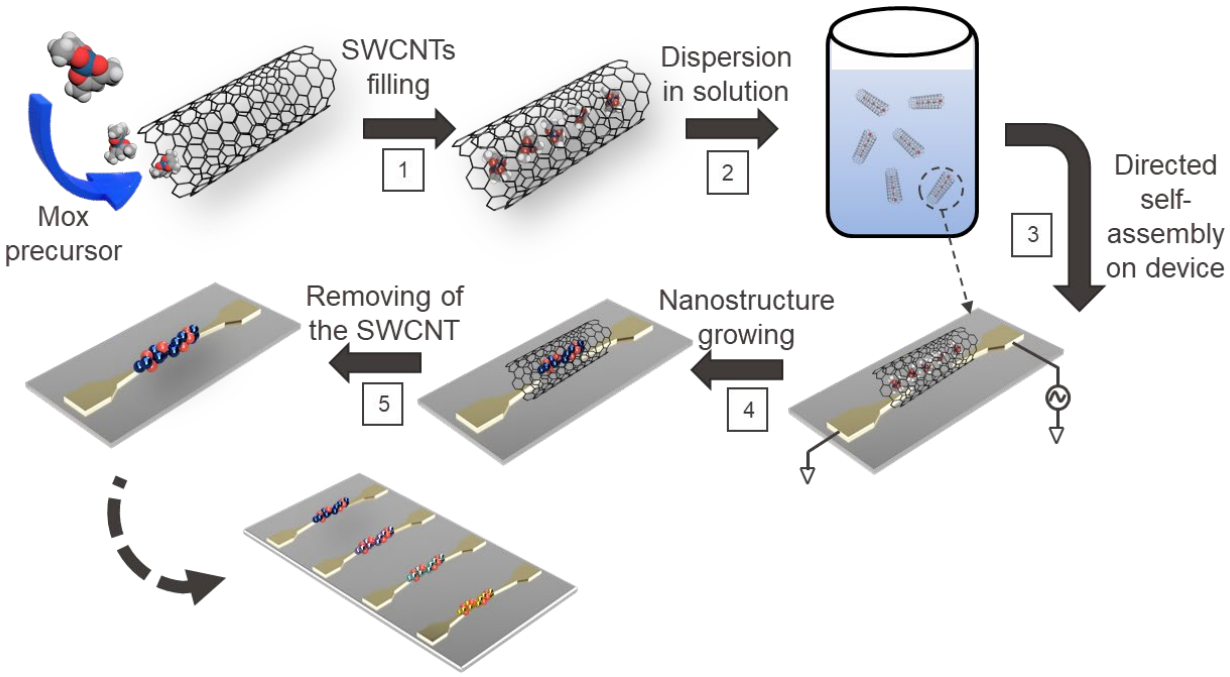
Semester project / Master project / Internship

(Section: microengineering, material science)

The student is welcome to choose the research aspect that he/she is the most interested in the following project.

We propose to control at the microscale the placement of nanohybrids at predefined locations with high-density by electric-field-assisted self-assembly. It is an alternative method that utilizes the interaction between a non-uniform electric field and the induced dipole of the nanohybrids. For this study, we will consider 2 types of nanohybrids:

1) Growing of advanced metal oxide structures using single-walled carbon nanotubes (SWCNTs) as "nano test tubes" and vessels to allow their linear deposition between pairs of electrodes on a single electronic device for gas sensing application.



Scheme of the process.

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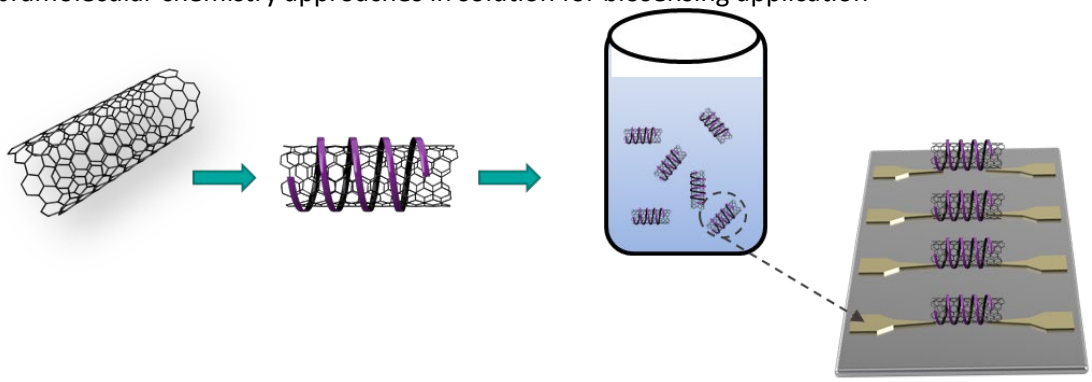
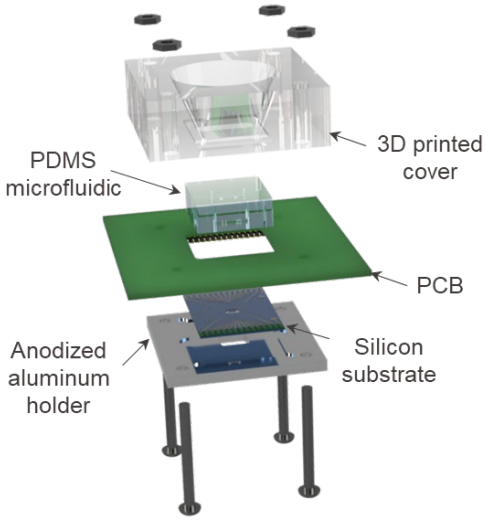
2) Coupling of artificial bioactive moieties such as DNA with semiconducting SWCNTs through supramolecular chemistry approaches in solution for biosensing application



Scheme of the process

The device is subsequently connected to a platform designed at the laboratory for electrical connection (no wire bonding) and sensing properties study has shown below.



Work description:

- Growing of metal oxide nanostructures as described in 1) with high vacuum sealing system
- Microfabrication of the silicon chip to host the nanohybrids
- Topography characterization of the nanohybrid immobilization by AFM
- Electrical characterization: Field-effect transistor configuration, I-V curves
- Chemical sensing of toxic gases and/or biomarkers

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