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.
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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