

Project Type: **PhD thesis**

## **Design, fabrication and characterization of thermoelectric microgenerators for their application in energy harvesting.**

### **Short Description**

The Project will take place under the supervision of the thermoelectric harvesting team which belongs to the MicroEnergy Sources and Sensors Integration Group of IMB-CNM (CSIC). This team has a long record of R+D activities in the field of thermoelectric microgenerators. These devices are based on micromachined silicon platforms where silicon (and silicon-germanium) nanowires are integrated as thermoelectric material. In this way, the integration and miniaturization capacities of silicon technology and the improved material properties at the nanoscale are fully exploited.

The fabrication of the microplatforms and the characterization of the devices take place in our own laboratories, including the use of the CNM Clean Room, which is considered one of the Singular Scientific and Technic Facilities in Spain. The research team has close collaborations with other institutions, especially with respect nanowires growth and integration.

The final goal of this research is improving the thermal and electrical behaviour of those generators at microplatform and material level and find a way to integrate a heat exchanger on the device so that the largest fraction possible of the temperature difference available at a given application scenario is captured and transduced into useful power for providing energy autonomy to sensors.

### **Background & skills required**

This field of work is quite transversal and multidisciplinary. It may be attractive to different studies profiles. Physics, electronic engineering, nanoscience and nanotechnology are just examples. Basic background on multiphysics simulation, thermoelectric and electrical characterization techniques and setups would be appreciated but training will be anyway provided. The team is international so English is needed on a regular basis.

### **Tasks**

The tasks to be performed will be related to the design, simulation, fabrication and characterization of silicon based microstructures for their integration with materials that enable their use as thermoelectric harvesters. After the candidate gets acquainted with the team and with the necessary thermoelectric and microtechnology background, he/she will help in the successful development of the last generation of highly integrated thermoelectric microdevices the team will be working with. The degree of involvement will depend on the project being a TFG, master thesis or PhD thesis.

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