



**Carbon Nanotube based sensors:
Multiphysics modelling and experiments
1-year post-doctoral position at École Polytechnique**

Background

Ecole Polytechnique and IFSTTAR have developed a printing technology to fabricate piezoresistive flexible sensors out of a random assembly of carbon nanotubes (CNT) deposited on polymers. The films are stretchable by applying strain along different axes and recover their initial configurations upon releasing the strain. They can therefore be considered, as a rough approximation, as spring-like structures made of carbon nanotubes.

Their overall electric conductivity is sensitive to strain, but also depends of the conduction mechanisms in the CNT's, the contact between the CNT's and the environment, etc. We seek to understand the multiscale physical phenomena responsible for the conductivity and piezoresistivity of the sensors using coupled multiphysics experiments.

Proposed research

LMS (Laboratory of Solid Mechanics) and LPICM (Laboratory of Physics of Interfaces and Thin Films) at École Polytechnique are undertaking a collaborative study on the operation and damage mechanisms arising in devices with nanoscale architectures during coupled environmental and mechanical loadings. An original, joint LMS-LPICM, experimental platform dedicated to multiphysic loadings and characterization is being developed. It is in the setting of this collaboration that the presently advertised post-doctoral position is available. The objectives of this project are:

- To measure the influence of various loading and environmental factors (strain, temperature, humidity, etc.) on the resistivity of the CNTsensors.
- To characterize the CNT-structure using different microscopy techniques.
- To develop phenomenological models able to predict the effective behavior of CNT-based sensors during cyclic loading, including damage and lifetime.

The experimental campaign will be conducted with the assistance of the researchers in charge of the sensor manufacturing (LPICM) and of the experimental platform (LMS & LPICM).

Application

The successful candidate will have a strong background in continuum mechanics and physics.

Deadline: january, 25th 2015.

Starting date: ideally march, 1st 2015.

Contact

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LPICM <http://www.lpicm.polytechnique.fr/>