

## Proposal for a PhD position

### **Nanosensors for pressure and temperature mapping within lubricated contacts**

In the frame of the Nanofluo project, Institut Carnot I@L (Ingénierie @ Lyon)  
Financed by ANR, 3-year contract, to start in September 2012

Pressure and temperature are two key-parameters in analyzing the response of lubricated interfaces like those existing in highly loaded mechanisms (gears and rolling element bearings for instance). The understanding of the actual physical phenomena that occur within lubricated contacts is highly dependent on the knowledge of the distributions of these two parameters. This statement motivates the development of innovative techniques for *in situ* and local characterization of physical parameters within a lubricated contact.

In the frame of the Nanofluo project, a cutting edge technique based on the fluorescence of pressure and temperature-active nano-sensors is under progress. Based on preliminary work, a significant variation of the fluorescence signal (wavelength, intensity, full width at half maximum) is expected as a function of temperature and pressure.

This project relies in an interdisciplinary approach between mechanics, physics and chemistry that involves the competencies of two groups:

- The Lyon Institute of Nanotechnology (INL) has expertise in the production, functionalization and structural characterization of nanoparticles
- The Contact and Structure Mechanics Laboratory (LaMCoS) is specialized in the characterization and modeling of very thin lubricating films.

In October 2011, a first PhD has started on the synthesis and characterization of Si and SiC nanoparticles, on the study of their behavior under static conditions as well.

The proposed PhD project aims at developing the use of nanosensors under dynamic conditions (i.e. within thin fluid films boarded by moving surfaces) and at giving the evidence on the suitability of the technique in lubricated contacts. This project involves an interdisciplinary approach between mechanics, physics and chemistry. A strong collaboration (team-work) with our partner INL is expected.

Applicants should have (or are expected to achieve) an engineering degree and / or a master in Mechanics, Physics or Material Science. Candidates should have a strong motivation for experimental work and for carrying out an interdisciplinary research. Knowledge on tribology and lubrication would be appreciated.

**Keywords:** nano-particles, fluorescence, *in situ* techniques, pressure and temperature mapping, EHD lubrication, thin films, dissipation.

**Support:** three-year contract in the frame of the Nanofluo awarded by the Institut Carnot I@L (Ingénierie @ Lyon). The net salary will be of approximately 1700€/month.

#### **Supervision and contacts:**

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