
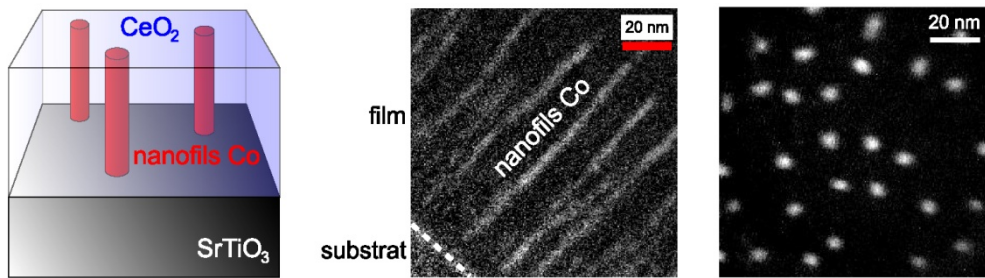


**Internship proposal 2009-2010**

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***Ultrathin ferromagnetic wires: a nanomagnetism playground***

A current challenge in condensed matter physics is to shrink the size of materials in order to induce new phenomena linked to low dimensions. From a more technological point of view, size reduction could lead to e.g. devices with higher storage density. Concerning more specifically the field of magnetism and spintronics, magnetic nanowires (long wires with diameters of a few tenths of nanometers or less) have attracted increasing attention in recent years due to their peculiar magnetic properties. Recently [1], we have demonstrated the possibility to grow ferromagnetic nanowires (NW) embedded in a crystalline matrix deposited as a thin film on a substrate by pulsed laser deposition (PLD), as shown in FIG. 1.



*FIG. 1: Scheme of Co nanowires assembly embedded in CeO<sub>2</sub>/SrTiO<sub>3</sub>(001) epilayers as obtained by PLD. Energy-filtered transmission electron microscopy images of the NW containing epilayers in cross section and plane view. The images have been acquired at Co L-edge allowing us to perform a chemically sensitive mapping of cobalt.*

The proposed subject is the study of the growth and magnetic properties of ferromagnetic nanowires in a range of dimensions (diameters 1-5 nm) almost never studied up to now.

[1] F. Vidal, Y. Zheng et al. *Appl. Phys. Lett.* **95**, 152510 (2009).

**Techniques in use:** Pulsed laser deposition, x-ray diffraction, SQUID magnetometry, electron microscopy

**Applicant skills:** good background in condensed matter physics and taste for experimental physics

**Granted internship :** yes ( ~350 €/month)  
**C'nano IdF laboratory (France only) :** yes  
**Possibility for a thesis :** yes (type of grant : Ecole Doctorale)