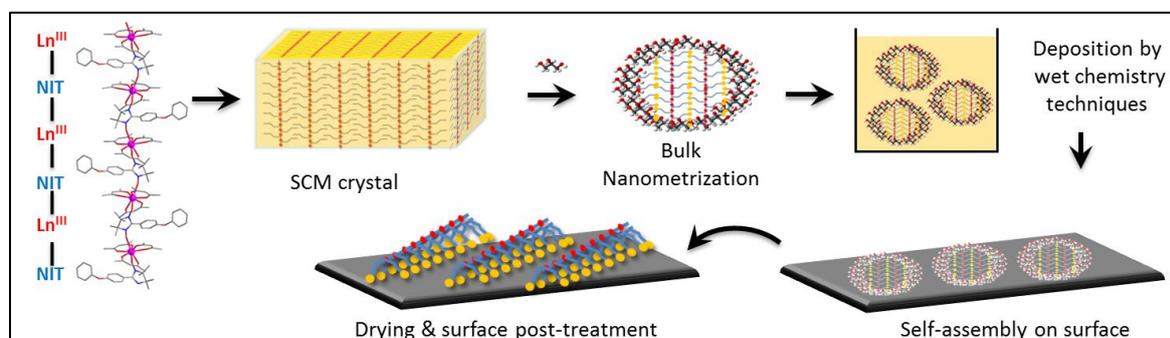


PhD Thesis proposal (starting October 2018)
“SURFACE DEPOSITION OF MAGNETIC MOLECULAR CHAINS”

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Single-Molecule Magnets (SMM) are molecules that behave as nanoscale magnet at the nanoscale.¹ They have been targeted as magnetic molecular memories as they may offer tremendous breakthrough in the storage of magnetic information. However, their interaction with the surface is not well controlled because of the difficulty to tailor spin-phonon interactions. We propose here to use their chain-like analogue Single-Chain Magnets (SCM).² Indeed, their physics is severely different from the one of SMMs as magnetic relaxation is not governed by spin-phonon interactions but by the much robust Glauber's dynamics.



This project aims to investigate the surface deposition of Single-Chain Magnets (SCMs) to create advanced magnetic materials with original magnetic behaviors. Our in-house knowledge of the synthesis of coordination polymers nanoparticles will be transferred towards SCMs. Such nanoscale vectors may allow for the unprecedented deposition of SCMs on surfaces; that given their polymeric nature cannot be nanostructured via simple strategies. This project will pave the road toward the discovery of new magnetic phenomena in one-dimensional molecular magnetic structures interacting with specific surfaces. By varying the characteristics of these coordination chemistry-based chains (introducing specific functional groups) and playing with the nature of the substrate we will study how these interactions as well as the SCM properties can be modulated and exploited in future devices. The project implies a tight collaboration with experts in the field of surface science, magnetic measurements and quantum chemical simulations.

• **Co-direction:**

Kevin Bernot, INSA Rennes, ISCR Assistant Professor, HDR, 37 y.o. <http://iscr-csm.insa-rennes.fr/kevinbernot/>
Matteo Mannini, University of Florence, Italy, Laboratory of Molecular Magnetism (LaMM), 39 y.o. <https://www.lamm.unifi.it/vp-169-matteo-mannini.html>

• **Teams & partnership:**

Our team is strongly involved in the design and magnetic characterization of molecular magnetic molecules based on lanthanides ions. Contributors from **LaMM** are world leaders and pioneer in the magnetic and computational characterization of SMMs deposited on surfaces.³ This collaboration is a unique way to use the extremely

complementary skills of the two teams. Strong relationship existed between our two teams in the last 10 years (21 joint publications, 2 PhD in co-direction,...). We recently collaborated with **LaMM** on molecules on the thematic of the PhD proposal.^{4,5}

- **Mobility:**

Mobility of the PhD students will be mandatory to achieve the goal of the PhD. Synthesis, magnetic and luminescence measurements will be performed in Rennes. Surface deposition and characterization will be performed during stays in Florence. Various stays in large scale facilities could be also planned.

- **Applicant**

The applicant should have an interest in a multidisciplinary project in **Coordination Chemistry** (synthesis, crystallography, luminescence, magnetism, surface science). A background in “soft matter” chemistry will be appreciated.

[1] C. Benelli *et al.*, *Introduction to Molecular Magnetism: From Transition Metals to Lanthanides*; Wiley, 2015. [2] L. Bogani *et al.*, *J. Mater. Chem.* **2008**, 18. [3] M. Mannini *et al.*, *Nature* **2010**, 468. [4] E. Kiefl *et al.*, *ACS Nano* **2016**, 10. [5] I. Cimatti *et al.*, *Appl. Surf. Sci.* **2017**.