Prof. Caroline Andreazza :

"Phase transition in nanoalloys: Defects and kinetic effects"

From a general point of view, the project intends to answer to one of the main objectives in nanoscience which consists to reveal the nanostructure of nanoalloys. The knowledge of the atom arrangement in nanoparticles composed of two or more metallic compounds is essential in order to understand and to tune their functional properties.

The project aims at preparing and characterizing nanoparticles with potential applications in plasmonic or catalysis coupling different metals such as Pt, Co, Ag.
An ultra-high vacuum experimental equipment, especially devoted to the preparation of the nanoparticles will be used. This equipment allows co-deposition or sequenced deposition of the two or three metals leading to alloyed or core-shell nanostructure.
Taking account of the ultimate size of these objects (2-10nm), studying their structural and chemical characteristics is quite a complex task which will require the use of a combination of well-dedicated techniques. Transmission electron microscopy (HR, HAADF, EFTEM modes), X-ray methods (x-ray diffraction and small angle x-ray scattering), XPS and RBS methods will be used in order to provide complementary informations on the chemical order and an accurate description of the structure.
The effect of the temperature and preparation mode (co-deposition or sequential deposition) will be particularly studied in order to define the kinetic effects on the phase transitions.

Profile of the student:
The student should follow graduate studies in Materials Science, Condensed matter physics, or related discipline. He/she will be first trained to UHV preparation method and to the specific approach required for nanomaterials investigations.
Experimental skills and care will be needed to carry out this project. The student should also have good communication skills to participate in this collaborative work.

Keywords: Nanoalloys, phase transition, UHV evaporation, structural characterizations method

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