

Title:

Incommensurate interfaces between crystals and complex intermetallic compounds at the nanoscale.

Project description:

Complex metallic alloys (CMA) like quasicrystals and their approximants can be described as packing of cluster units consisting of a few tens of atoms forming a regular polyhedron. Quasicrystals have long-range order but no translation periodicity while approximants are periodic structure with large unit cells containing cluster units similar to those found in parent quasicrystals. These intermetallic complexes have properties that differ from those found in conventional alloys. They are currently considered for a number of technological applications, in particular as new functional coating materials.

The main objective of this thesis will be to study the structure and properties of incommensurate interfaces between complex metallic alloys like quasicrystals and simple metals. A dual approach will be used. First the growth of metal thin films on CMA substrates will be investigated *in situ* by scanning tunneling microscopy and low energy electron diffraction (STM, LEED) to obtain an atomistic description of the growing interface plane. In a second step, lamella will be extracted by focused ion beam (FIB) to visualize the structure perpendicular to the interface plane by high-resolution transmission electron microscopy (TEM) will be employed. Complementary information relative to the interfacial energy knowing the interface structure will be studied using a numerical approach by *ab initio* calculations.

The thesis will be carried out within the group 'Surface and Metallurgy' at the Jean Lamour Institut in Nancy, France (<http://www.ijl.nancy-universite.fr/>) and in the framework of the international laboratory LIA-PACS with the Jozef Stefan Institut in Ljubljana, Slovenia as well as the European level within the European C-MAC network (see www.eucmac.eu), gathering leading teams in the field of science and nanoscience on complex alloy surfaces.

Applicants should have a degree in a relevant physics, chemistry or materials science discipline. Applications including your full CV, academic records, publication list (if applicable), should be sent electronically.

Contacts:

Vincent Fournée, Tél: 03 83 58 42 14. **E-mail** : vincent.fournee@univ-lorraine.fr
Julian Ledieu, Tél : 03 83 58 41 97. **E-mail** : julian.ledieu@univ-lorraine.fr
<http://ijl.univ-lorraine.fr/la-recherche/departement-cp2s/metallurgie-et-surfaces/thematiques.html>