Advanced Electron Microscopy and NanoStructures

Materials and Quantum Phenomena Laboratory (MPQ)
Paris Diderot University (Paris)

Permanent staff:
Damien Alloyeau (CR), Jaysen Nelayah (MCF)
Guillaume Wang (IR), Christian Ricolleau (PR)

Non Permanent staff:

PhD students: 2 – 4 / year

Post Doc: 1 – 2 / year
Nanoalloys : structuring the french community

• Setting up of the Nanoalloy GDR 2008-2011 and renewed in 2011 for the 2012-2015

• Substitute member of the managing committsee of the european COST action on Nanoalloys (2010-2014)

Main topics of interest of the Me-ANS group

• **Thermodynamic properties of nanoalloys**: past: CoPt, AuPd, now and future: CuAu
  Collaboration with Hakim Amara (LEM, CNRS/ONERA), Jérôme Creuze (ICMMO, Orsay), and, in the past, Christine Mottet (CINaM, Marseille) and Geoffroy Prévot (INSP, Sorbonne University).

• **Size effect on the stability of chemical composition** in CoPt and AuPd.

• **Reactivity of nanoalloys** as a function of temperature and gas environment

**Information of interest:**
- structure - catalytic properties relationships
- structural modification induced by catalytic reactions
New generation TEM at MPQ

- ARM 200 F cold FEG + aberration corrector of the objective lens:
  - unique configuration in France and not worldwide available
  - integrated in an advanced electron microscopy platform
  - integrated in a national network for TEM and Atom probe

- Cooperation agreement framework with JEOL (Tokyo)

Project for 2019 / 2020:
Upgrade of the actual microscope with a 2nd generation probe corrector and a SDD EDXS detector for chemistry analysis at the atomic level.
In situ electron microscopy

In situ gas TEM

MEMS-based technology

In situ liquid TEM

P: up to 1 atm (O₂, H₂, …)
T: up to 1000 °C

2 Syringe Pumps
In situ experiments in liquid TEM: possible effect of bimetallic corrosion in CuAu nanoalloys

Dose-dependent and fully reversible growth/etching of Cu on Au nanoplates in methanol