



## Iron group metal electrodeposition at nm scale

P. Allongue\*

Physique de la Matière Condensée, Ecole Polytechnique, CNRS, 91128 Palaiseau (France)

**Abstract:** metallic ultrathin layers with a thickness of a few atomic planes are important in several fields of fundamental research and technology. Studies demonstrated the impact of tensile strains, induced by growth, and electronic effect induced by the substrate proximity on electrocatalytic properties. In nanomagnetism the surface atoms and at interface with the substrate play a dominant role on resulting properties when the films become ultrathin.

This is in this context that we have studied the early stages of epitaxial electrochemical growth of iron group metals films (Co, Ni and Fe) on Au(111) using in situ STM and SXRD [1-3] and their magnetic properties using in situ real time magneto optical Kerr Effect (MOKE) characterizations [4-5]. We have also investigated alloying by co-depositing Ni with various noble metal (Ag, Au, Pd) in the ultimate limit of one single 2D atomic plane [4-6]. We also attempted to determine the substrate – adatom energy by using depositing Ni on bimetallic AuPd(111) surfaces [7].

This lecture will present selected examples among those cited above to discuss: for instance how the atomic structure of the surface impact epitaxy, how substrate – adatom interaction, surface mobility impact alloying, how surface magnetism was used to probe the electrochemical interface structure and its reactivity.

### References:

- [1] F. Lecadre, et al. *Surf. Sci.* 631 (2015) 135.
- [2] C. A. Lucas et al. *Journal of Physical Chemistry C* 120 (6) (2016) 3360.
- [3] N. Di et al. *J. Electrochem. Soc.* 163 (2016) D3062.
- [4] N. Tournerie et al. *Phys. Rev. B* 86 (2012) 104434.
- [5] N. Tournerie et al. *Surf. Sci.* 631 (2015) 88.
- [6] A. Damian et al. *Nanoscale* 8 (2016) 13985.
- [7] F. Lecadre et al. *Electrochim. Acta* 197 (2016) 241.
- [8] F. Lecadre et al. *Surf. Sci.* 607 (2013) 25.
- [9] A. Damian et al. *Phys. Rev. Lett.* 102 (2009) 196101.

---

\*main author e-mail: philippe.allongue@polytechnique.edu