Séminaire

INSTITUT Charles SADRON
UPR 22 - CNRS - STRASBOURG

Mardi 07 janvier 2019 à 10h30
Amphithéâtre Henri Benoît

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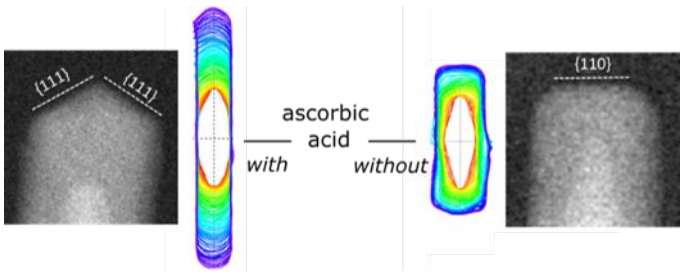
Growth kinetics of bimetallic nano-particles followed by in situ techniques

Surface plasmon resonances of noble metal nanoparticles can be modulated by tuning the particle morphology (size, anisotropy, edge roundness) or by covering them with a different metal. It is however difficult to study this complex process, due to the lack of unintrusive in situ techniques. An important challenge in the field is to correlate in situ single particle monitoring with other techniques, which follow the synthesis in the bulk.

We explore the seeded growth of Au-Ag core-shell noble metal particles by small-angle X-ray scattering, by UV-Vis absorbance spectroscopy and by environmental transmission electron microscopy (ETEM) in liquid cell. The results are correlated with ex situ measurements performed on quenched aliquots extracted from the reaction medium.

I will show that using several complementary methods to follow the same system during its evolution yields a more detailed and reliable picture of the process than any one technique taken separately. I will discuss the influence of the various parameters on the kinetics and the final shape of the particles. In particular, our investigation reveals a double role for ascorbic acid (widely used as reducing agent): we prove that it also plays a shape-directing role, by stabilizing the {100} facets of the silver cubic lattice, in synergy with the halide ions [1].



[1] K. Aliyah et al., Real-Time in situ Observations Reveal a Double Role for Ascorbic Acid in the Anisotropic Growth of Silver on Gold. ChemRxiv preprint, https://doi.org/10.26434/chemrxiv.9994940.v1

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