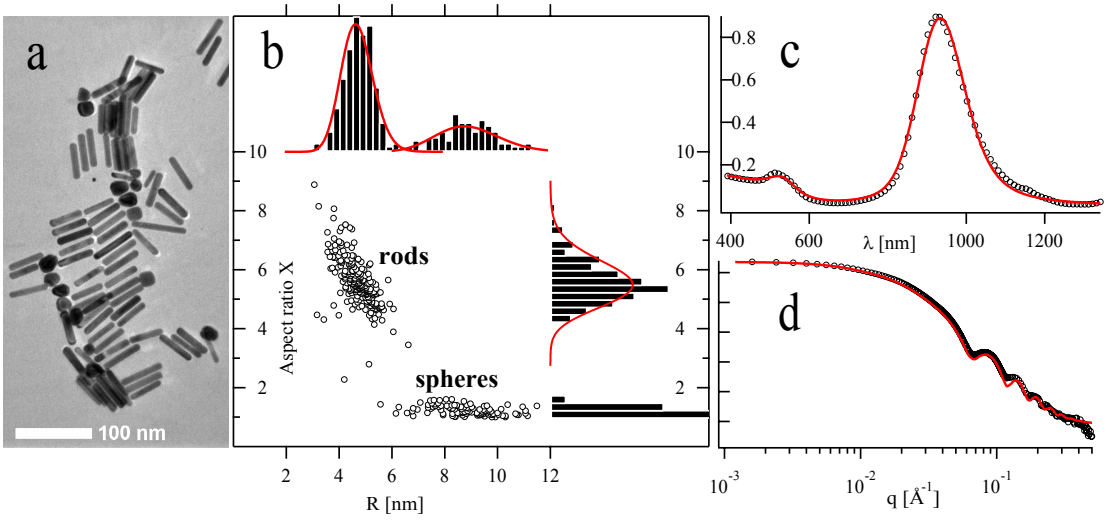
Multi-technique characterization of mixtures of gold nanoparticles

D. Constantin[1], K. Slyusarenko[1] B. Abécassis[1] & P. Davidson[1]

[1] *Laboratoire de Physique des Solides, CNRS, Univ. Paris-Sud, Université Paris-Saclay, 91405 Orsay Cedex, France.*

UV-Vis absorption spectroscopy is frequently used to characterize the size and shape of gold nanoparticles. We present a full-spectrum model that yields reliable results for the commonly encountered case of mixtures of spheres and rods in varying proportions [1].



The three techniques at a glance for one sample. (a) Selection from a TEM image. (b) TEM analysis : aspect ratio vs. radius for all analyzed particles, with histograms of both parameters. The solid lines are Schulz distributions. (c) Absorbance spectroscopy data and (d) SAXS data for the same sample.

We determine the volume fractions of the two populations, the aspect ratio distribution of the nanorods (average value and variance) and the interface damping parameter. We validate the model by checking the fit results against small-angle X-ray scattering and transmission electron microscopy data and show that correctly accounting for the polydispersity in aspect ratio is essential for a quantitative description of the longitudinal plasmon peak.

We will briefly discuss the corrections required by changes in particle geometry [2] and by the finite size effects [3] for a quantitative description of the absorbance spectrum.

1. Slyusarenko K., Abécassis B., Davidson P. & Constantin, D. *Morphology of gold nanoparticles determined by full-curve fitting of the light absorption spectrum. Comparison with X-ray scattering and electron microscopy data*, Nanoscale 6, 13527-13534, 2014.

2. Constantin, D. *Why the aspect ratio ? Shape equivalence for the extinction spectra of gold nanoparticles*, Eur. Phys. J. E 38, 116, 2015.

3. Constantin, D. *in preparation*.