# Contribution to SPICPMS Accurate Spherical Gold Nanoparticles Size Determination: a Comparison with Small Angle X-ray Scattering

Valérie Geertsen, Olivier Taché, Elodie Barruet, Frédéric Gobeaux, Jean-Luc Lacour

# Contribution to SPICPMS Accurate Spherical Gold Nanoparticles Size Determination: a Comparison with Small Angle X-ray Scattering

Valérie Geertsen*[1], Olivier Taché , Elodie Barruet , Frédéric Gobeaux , and Jean-Luc Lacour

[1]Nanosciences et Innovation pour les Matériaux, la Biomédecine et l'Énergie (NIMBE - UMR 3685) – Commissariat à l'énergie atomique et aux énergies alternatives, Université Paris-Saclay, Centre National de la Recherche Scientifique – CEA Saclay 91190 Gif sur Yvette, France

**Abstract**

Small Angle X-rays Scattering Spectroscopy (SAXS) is the method of choice for nanoparticle diameter and concentration determination. It is metrologically traceable for spherical nanoparticle mean diameter determination and does not require any sample preparation or calibration. On the other hand, Single Particle ICPMS (SPICPMS) is still under developments and requires involved process clarification and accuracy improvement.
The strategy of this presentation based on 6 spherical gold nanoparticle suspensions distributed over a large size range (30, 50, 60, 80,100 and150 nm), is the comparison of the two techniques to study comprehensively SPICPMS performance and observe phenomena:

Potential matrix effect are eliminated by stabilizing nanoparticles with chitosan in HCL. Chitiosan encapsulates nanoparticles, stabilizes their dispersion and protects them from dissolution.

Detection counting/analog threshold and timeout appear as the relevant parameters for transient signals. They show an influence not only on mean signal but also on signal distribution. The detection tuning proposed allow to linearly calibrate the nanoparticle distribution signal to cubed diameter over the entire range studied with no sensitivity diminution.

Comparing the 3 classical transport efficiency methods (number, size and waste), size transport efficiency is shown as the most accurate.

A procedure is proposed, it is validated analyzing three gold nanoparticles suspensions (135, 40 and 50nm). The results are consistent with SAXS measurements.
*Anal. Chem. 2018, 90, 9742-9750*

**Keywords:** SPICPMS, SAXS, single nanoparticle, colloid stabilization, chitosan

*Speaker