

Metrology of Nanoparticles with Small Angles X-Ray Scattering (SAXS) : from simple cases to nanoparticles in food additives

O. Taché, Dr. V. Geersten, E. Barruet, Dr. O. Spalla, Dr. A. Thill, Dr F. Testard, S. Doco

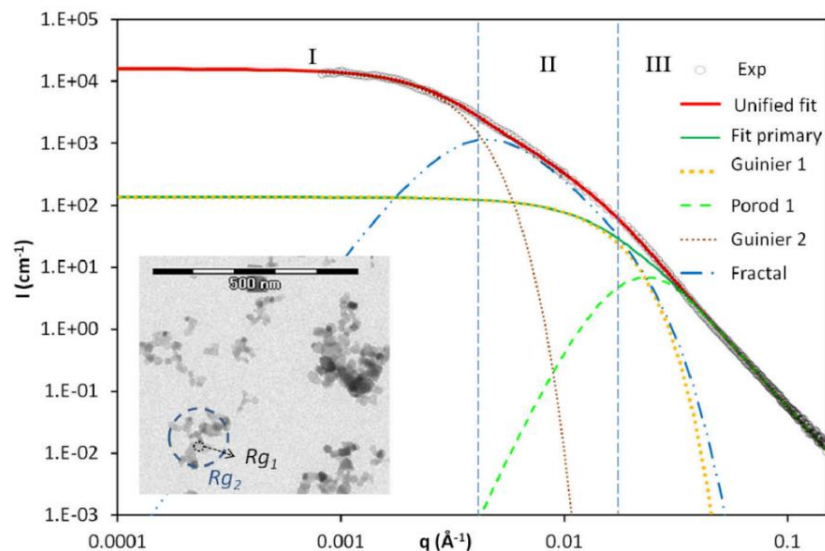
NIMBE (Nanoscience & Innovation Laboratory) / Fundamental Research Division / CEA Paris-Saclay
UMR 3685 NIMBE CEA – CNRS / Paris-Saclay University
91191 Gif sur Yvette Cedex FRANCE

Small-Angles X-Ray Scattering (SAXS) has been established as a metrological method for the determination of nanoparticles size and size distribution. Modern SAXS Laboratory experiments¹, by involving synchrotron-based instrumentation at lower price and very stable X-ray source, are more and more used in nanomaterials metrology.

In the frame of the EURAMET Innanopart project, we have developed a methodology for the size, size distribution and concentration determination of spherical nanoparticles. This protocol involves a precise sample preparation, a rigorous procedure for the data acquisition, and a set of homemade software tools for the data processing - from the acquisition, the absolute scaling, to the analysis.

The SAXS technique is very accurate for the characterization of simple case using nanoparticles : monodisperses, spheric form, unique composition. But it is more complicated in the case of nanoparticles size mixtures and in case of nanoparticles in complex media.

Recent works in the lab shows it is possible to achieve precise measurement on mixture of spheric nanoparticles and nanoparticles in complex media (food additives) using different software or methodology approaches.



SAXS Diagram representing accessible informations for nanoparticles in complex media

¹ Olivier Taché et al., « MOMAC: a SAXS/WAXS laboratory instrument dedicated to nanomaterials », *Journal of Applied Crystallography* 49, n° 5 (1 octobre 2016): 1624- 31, <https://doi.org/10.1107/S1600576716012127>.