



Investigation of Gold Nanoparticles

Shape and size of gold nanoparticles (NPs) in suspension have been determined by SAXS measurement.

Introduction

NPs are used even at very low concentration in many applications such as coatings, cosmetics or drug delivery. The performance of the final product depends not only on the chemical nature of the NPs but also on their shape, size and specific surface area. It is therefore essential to be able to control and quantify these key parameters.

Small Angle X-ray Scattering is a non destructive technique allowing material structure determination with very little sample preparation. It provides statistically relevant information over a large probed volume of sample. As such, it is an ideal complement to other imaging techniques which provide only localized information. This powerful technique provides structural characterization of nanoparticles with particle size from 1 to 250 nm.

SAXS measurements performed on a gold NPs suspension demonstrate the capability of the Xeuss 2.0 SAXS/WAXS system to provide consistent data for reliable modelisation.

Measurements & results

SAXS measurements were performed on a gold NPs suspension using the buffer *2.5mM citrate pH 6.9*.

Figure 1 shows the obtained 1D curve after buffer subtraction (red).

Data modeling enables accurate shape and size definition of particles. Fitting of the curve was performed using SASfit¹. The applied model consists of a sphere of radius $R = 16.16$ nm, with a polydispersity equal to 1.04% using a lognormal distribution law. The fitting curve (black) is displayed in Figure 1 and matches the experimental data.

Figure 2 shows a graphical representation of the gold NP sample size distribution.

To go further

Size and shape determination of large particles is achievable in the lab² using the Xeuss 2.0 SAXS/WAXS system.

Samples having internal structures with characteristic dimensions up to 200 nm were measured³ on the Xeuss 2.0.

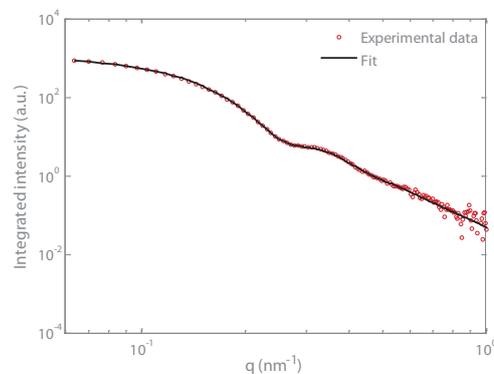


Fig. 1 - 1D SAXS curve from gold nanoparticles suspension sample.

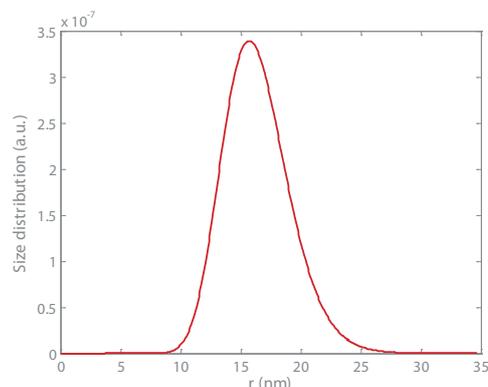


Fig. 2 - Size distribution profile.

¹SASfit 0.94.2, J. Kohlbrecher and I. Bressler.

²AN-XE01 - High resolution capabilities with the Xeuss 2.0 SAXS/WAXS system.

³Prof. Yongfeng Men at the Changchun Institute of Applied Chemistry, Chinese Academy of Sciences, China, <http://www.xenocs.com/testimonials/252-xeuss-usaxs-performance.html>