

# Average Size and Size Distribution of Silica Nanoparticle Powder by USAXS

## Introduction

SAXS is a powerful method to determine both average particle size and size distributions as an ensemble method. The requirement for accurate size and shape information is of importance in many of the emerging areas of nano-materials research currently taking place throughout the world.

Rigaku NANOPIX mini is the first benchtop small angle X-ray scattering system dedicated for the nanoparticle characterization in both research and production environments. With a revolutionarily small footprint and performance superior to traditional ‘Big iron’ systems, this compact instrument offers enhanced angular resolution through its line-focus X-ray source and superior combination of high figure of merit optics.



NANOPIX mini

## Experimental and Results

Silica nanoparticle powder having average diameter size of about 100 nm was measured with Rigaku NANOPIX mini (Figure 1). The sample is filled in the glass capillary and scanning range from -0.005 deg. to 1.25 deg. with 0.004 deg per step. The total measurement time is 25 min per sample. The plots show experimental data from silica nanoparticle powder. In this example, the experimental data have been overlaid with the simulated (from a distribution of normal distribution (Gaussian distribution) of particle sizes modelled in Rigaku software (Figure 2), Rigaku’s powerful software solution for SAXS data processing. The agreement between the experimental and simulated data shows that the proposed distribution model is in good agreements with what is actually contained in the sample, as observed by TEM.

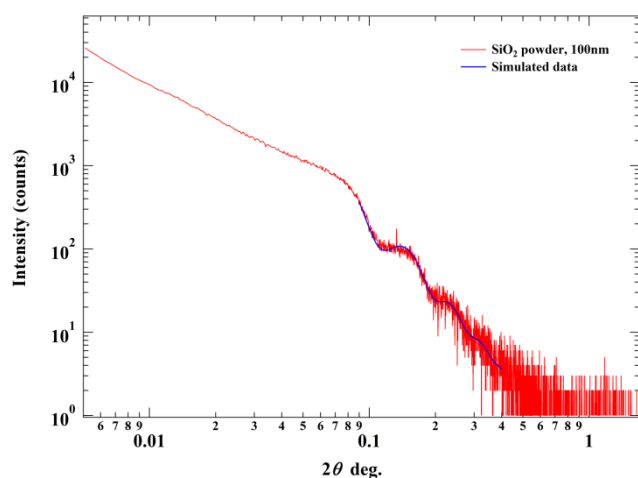


Figure 1 USAXS patterns from silica nanoparticle powder

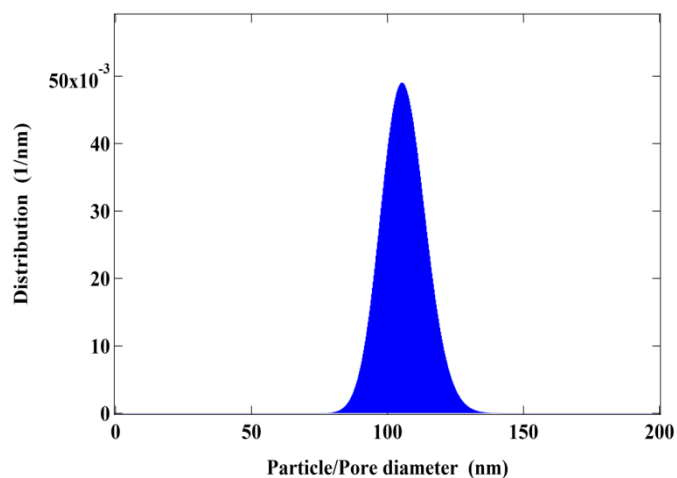


Figure 2 Resultant distribution of silica nanoparticle powder. Average diameter: 105.9 nm, Size distribution RSD: 7.7%