



A SAXS/WAXS laboratory instrument for nanomaterials characterization

Olivier Taché, Antoine Thill, David Carriere, Fabienne Testard, Olivier Spalla

► To cite this version:

Olivier Taché, Antoine Thill, David Carriere, Fabienne Testard, Olivier Spalla. A SAXS/WAXS laboratory instrument for nanomaterials characterization. Nanometrology France 2016, Jun 2016, Paris, France. cea-02346098

HAL Id: cea-02346098

<https://cea.hal.science/cea-02346098>

Submitted on 4 Nov 2019

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Important Notes for Abstracts Submission :

1. Please mention the conference Session/Topics you are interested to: **Nanometrology France 2016**
2. If this abstract is to be submitted for a Symposium, please mention the Symposium title:
3. Please submit the MS word version of the abstract and avoid submitting a PDF version

A SAXS/WAXS LABORATORY INSTRUMENT FOR NANOMATERIALS CHARACTERIZATION

Olivier Taché, Antoine Thill, David Carrière, Fabienne Testard, Olivier Spalla
LIONS, NIMBE, CEA, Université Paris Saclay, CEA Saclay, 91191
Gif-sur-Yvette, France.

Abstract:

Small Angle X-ray Scattering (SAXS) allows traceable measurements of size, size distribution, surface area, concentration and shape of nanomaterials in solutions, powders and in bulk materials.

We present here a custom-made state-of-the-art SAXS laboratory instrument (see Figure 1) based on Mo X-ray generator. Its design has been thought and optimized for the wide angles (WAXS) for investigate nanostructured material in particular in the size range from below 1 nm to above 20 nm.

The X-ray generator is a molybdenum (17 keV) rotating anode. A combination of a multilayer collimating mirror and a patented hybrid slits gives us a very sharp and high purity beam for a laboratory setup, with a size of 1x1 mm² and a flux of 10⁸ photons/s.

The motorized sample holder can load 20 capillaries, a temperature controlled system or a circulation environment system for kinetic studies. A vacuum chamber is placed behind whose output window diameter is designed for the 2D image plate Mar345 detector. The accessible q-range is $q_{min} = 0.03 \text{ \AA}^{-1}$ to $q_{max} = 3 \text{ \AA}^{-1}$.

A special attention was given to the complete data treatment processing (absolute intensities, uncertainties, reference samples, calibration,...), enable us to make traceable measurements.

Combining molybdenum energy and the state-of-art experimental setup provide us with a very powerful tool for nanomaterial studies [2][3].

We present here some results obtained with this experiment for inter-laboratories characterization studies in particular of silver nanoparticles, and Si nanoparticles.

Keywords: nanomaterials, nanoparticles, characterization, size and size distribution, nanoparticles concentration, inter-laboratories studies

Figure 1: photographic view of the SAXS-WAXS setup.

Figure 2 : SAXS datagram of silver nanoparticle (blue) and the fit model (red)

References:

Taché O. and al.

MOMAC: A SAXS/WAXS laboratory instrument dedicated to nanomaterials

Reviw Sci. Instr., In Press.

Fleury B. and al.

Gold Nanoparticle Internal Structure and Symmetry Probed by Unified Small-Angle X-ray Scattering and X-ray Diffraction Coupled with Molecular Dynamics Analysis

Nanoletter 2015

