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## A SAXS/WAXS LABORATORY INSTRUMENT FOR NANOMATERIALS CHARACTERIZATION

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### 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 mm<sup>2</sup> and a flux of 10<sup>8</sup> 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)

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