

Project name: SAXS testing of slit performance and creation of a standard for diffuse scattering from slit blades.

Beamtime Report

06.08.2013 - 07.08.2013 (Date of the report to be added)

General information

Name of the rapporteur	Name of the rapporteur's organisation
Christian Mammen	JJ X-ray
Type of research (nanotechnology/health care/chemistry etc.)	Name of the research facility
Materials Science	PETRA III at DESY in Hamburg
Date of the measurement, duration	Location of the event
06. August 2013; 24 hrs of beamtime	Beamline P10, Sectro 7, Petra III
Facility personnel participating in the measurement	
<i>Dr. Michael Sprung, Dr. Alexix Zozulya</i>	

Description of the project

Research description (short summary as written in the application)
<p>A beamline setup involves three sets of slits for beam collimation: two consecutive beam defining slits (slits 1 and 2) and one guard slits (slit 3). The latter eliminate the radiation arising from scattering interactions between the beam and the upstream slits. However, the guard slit are themselves sources of diffuse scattering that contributes to the background of the final scattering images in particular at small scattering angles. This can be a critical problem in SAXS experiments, where the scattering at small angles is of the utmost importance.</p> <p>Conventional beam collimation slits are made out of a heavy X-ray absorbing material (e.g. tungsten carbide, WC). Improved design of the guard slit combines a single crystal of e.g. Si mounted on the edge of the WC slits. The single-crystal Si generates significantly less diffuse scattering than the WC, partly due to the lower z, and partly due to the single crystalline structure. The single crystal effect on the diffuse scattering is not entirely understood, but is partly due to the almost perfect surfaces and edges.</p>
Summary of activities (experiments performed, beamtime used, preliminary overview of results, next steps and other relevant information)
<p>A SAXS study in the 10 keV range of different guard slits for beam collimation was performed: 2D SAXS patterns are recorded and integrated with the aim of decomposing the signal into components arising from 1) the main beam, and 2) the refraction and 3) diffuse scattering components from the guard slits. There were four different samples: two of single crystal Si, one of GaAs and one of Ge. The diffuse scattering from the Si</p>

crystals were comparable with previously results obtained at lab sources, but at a much higher resolution and with the high collimation of the synchrotron beam, the scattering from the slits 1 and slit 2 are suppressed.

The heavier materials Ge and GaAs provided less isotropic scattering than foreseen, and even the weak Kossel lines were observed.

There data analysis is still in progress but the intermediate results have already delivered the company valuable knowledge, which is already implemented in the products.

24 hrs of beamtime was granted for the experiment.

How would you describe cooperation and assistance from industrial liaison officers and national contact points while preparing and carrying out the research at large scale facilities?

We have had a professional and valuable assistance from the industrial liaison. We have been guided through the system and have only had good experiences.

Only we would have appreciated that the Science Link had also allocated more resources assisting the data analysis.

Other personal remarks

Annexes

Annexes

(list of annexes; meeting minutes, graphical illustrations, tables and other supplementary data)