

Development of a Large Angle X-ray Spreading Element for Projection X-ray Microscopy with Undulator Light Source

Mitsuhiro AWAJI

Japan Synchrotron Radiation Research Institute (JASRI), SPring-8, Kouto 1-1-1, Mikazuki-cho, Sayo-gun, Hyogo 679-5198, Japan

X-ray diffuser has been used for the purpose of eliminating image noises from various optical elements, and for the purpose of getting noiseless image. Therefore X-ray diffuser is now widely used in various imaging techniques such as laser optics, X-ray computed tomography (X-ray CT) and X-ray Topography. Though X-ray diffuser has been used for the purpose of noise elimination, a new possibility of X-ray diffuser as a large angle X-ray spreading element for use in projection X-ray microscopy with undulator light source is discussed. Figure 1 shows the experimental setup for the measurement of angular spread of 30keV X-rays. The X-ray spreading elements used in this experiment are made of Al_2O_3 and SiO_2 powders. Figure 2 shows the measured angular spread in related to the average grain size of Al_2O_3 powders. It was measured that the maximum angular spread was $104\mu\text{rad}$ at $2\mu\text{m}$ grain size, and the angular spread was depressed at smaller average grain sizes. As the reason for the rapid decrease of the measured angular spread at grain sizes of 0.05 and $0.35\mu\text{m}$ was guessed that is due to coagulation of each Al_2O_3 particle, a SiO_2 slurry whose SiO_2 particles does not coagulate each other, was tested as an X-ray spreading element. Figure 3 shows the measured intensity profile of the spreaded beam from the mixed SiO_2 slurry (72nm grains mixed with 8.2nm grains). The angular spread of about $1000\mu\text{rad}$. was achieved.

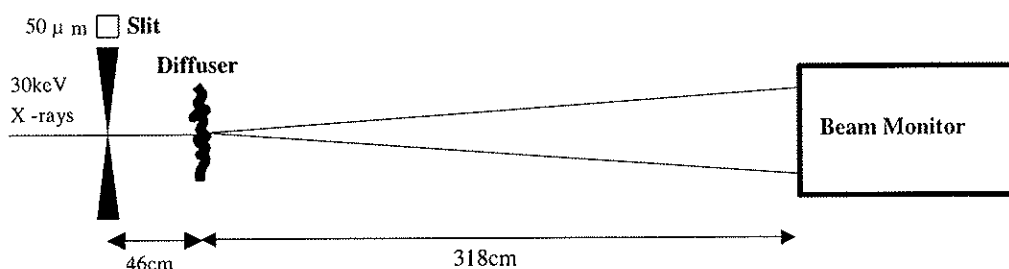


Figure 1 Scheme of the experimental setup

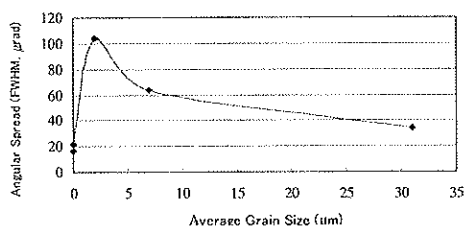


Figure 2 Relation between Al_2O_3 grain size and angular spread

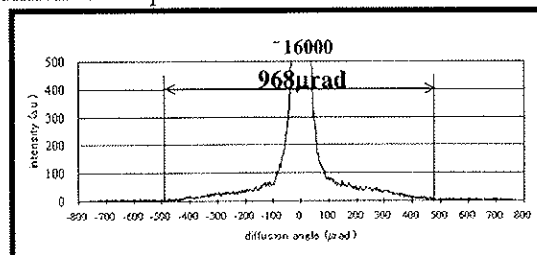


Figure 3 Intensity profile of the field of vision using the mixed grain size SiO_2 slurry