s4.m1.p5 Standing wave formed close to rectangular surface grating by the grazing-angle incidence x-rays.

P.A. Bezirganyan (Jr.), *Dep. of Computer Science, State Engineering University of Armenia, #105, Terian Street, Yerevan 375009, Armenia. E-mail: petros@freenet.am* A.P. Bezirganyan and S.E. Bezirganyan, *Dep. of Physics, Yerevan State University, #1, A. Manoogian Street, Yerevan 375025, Armenia. E-mails: hbezirg@www.PhysDep.r.am,sbezirg@www.PhysDep.r.am* H.A. Bezirganyan (Jr.), *Dep. of Informatics and Applied Mathematics, Yerevan State University, #1, A .Manoogian Street, Yerevan 375025, Armenia. E-mail: haikbn@freenet.am*

Keywords: X-ray standing wave, grazing-angle incidence, surface grating.

The morphology of thin films deposited on rough surfaces is of great interest, both in basic research and in materials science, particularly in the investigations concerning the growth of films and multilayers [1]. The x-ray diffraction measurements of thin polystyrene films deposited on laterally structured surfaces were investigated in the original work [1]. The experiments in [1] were performed using x-ray scattering in the region of small incidence angles to investigate the layer thickness and structures of the interfaces grating-polystyrene and polystyrene-air, as well as using the atomic force microscopy to examine directly the topmost surface. The calculations of x-ray scattering intensity were done in [1] within the Born approximation.

The x-ray intensity calculations are more correct if someone uses an equations, which describe the dynamical x-ray standing wave (XSW) fields formed very close to surface grating on dielectric substrate. The entire wave field intensity is periodical above the sample surface and is modulated along this surface (e.g. see [2]) in the case of the grazing angle incidence x-ray diffraction (GID) geometry.

We consider in this paper the x-ray GID by a rectangular periodical surface grating. The XSW in the GID case makes it possible to study more correctly the shape of thin polystyrene films deposited on laterally structured surfaces. The mathematical model corresponding to the investigated surface grating is constructed. The description of the x-ray standing wave is based on the method of construction of eigenvalues and eigenfunctions [3] for the model under investigation.

[1] M. Tolan, G. Vacca, S. K. Sinha, Z. Li, M. Rafailovich, J. Sokolov, H. Lorenz and J. P. Kotthaus, J. Phys. D: Appl. Phys. **28**, A231 (1995).
[2] A.P. Bezirganyan and P.A. Bezirganyan, Phys. Stat. Sol. (a), **105**, 345 (1988).
[3] P.A. Bezirganyan (Jr.), A.P. Bezirganyan, S.E. Bezirganyan and H.A. Bezirganyan (Jr.), Abstracts XVIII IUCr Congress and General Assembly 4th–13th August (Glasgow, Scotland, UK) 177 (1999).

s4.m1.p6 High brightness x-ray sources – implementation and benefits.

M Taylor, G Fraser, N Loxley and J Wall, *Bede Scientific Instruments Ltd, Bowburn South Industrial Estate, Durham, DH6 5AD, UK.* L Pina, R Hudec and A Inneman, *Reflex sro, Advanced X-ray Technologies, Novodvorska 994, CZ-14200 Prague 4, Czech Republic.*

Keywords: diffraction physics.

Improvements in X-ray optics and in the design of electromagnetically focused X-ray tubes have enabled a new generation of X-ray generators to be built which are compact and give large improvements in brightness over that given by standard sealed tubes. The design and operating principles of these tubes will be described.

The Microsource® X-ray generator is about the same size as a laboratory sealed tube but with a power consumption of only tens of watts and has a performance equivalent to that of some rotating anode and optics combinations.

Presently 10^10 copper k alpha photons per second per square millimeter are delivered into a 0.5mm spot at the sample point. The efficiencies are gained by the use of a microfocus beam on the target and the use of a range of interchangeable X-ray optics to transfer the intensity from the target to the sample.

The Microsource can be used to advantage in the field of single crystal X-ray diffraction, for example protein crystallography and examples will be shown.

In addition to protein crystallography, the Microsource now permits the examination of a broad range of samples and sample environments which would either be on the limit of signal to noise for standard sealed tube generators or too cumbersome for larger generators.

Illustrations will be given from a variety of fields including microdiffraction, non-ambient conditions and time dependant studies. Examples of instrumentation will be shown where standard sealed tubes have been replaced by Microsources resulting in a significant enhancement of speed and sensitivity. Possibilities for examining samples rapidly on-line will be examined.

The outlook for extending the range of target materials and X-ray optics to radiation other than copper will be reviewed.