Laboratory Note

J. Appl. Cryst. (1981). **14**, 280

A high-resolution X-ray facility

The purpose of this note is to report that one can make, *with relative ease*, an extremely fine 'slit' system by means of asymmetric diffraction. The one we built has an angular resolution better than two seconds of arc when Cu $K\alpha$ radiation is used. The system utilizes a pair of asymmetrically cut Si(111) crystals (ACC) to collimate and detect X-rays with a sample inserted between the two ACC's. These two crystals, having an asymmetry factor $m=38$ for Cu $K\alpha$ radiation, can be arranged either in energy-dispersive or non-dispersive configurations for which $\Delta E/E=3.6\times10^{-5}$ and $\Delta K=8\times10^{-5}$ Å^{-1} are obtained, respectively. The diffraction principle responsible for this development is the well-known fact that the exit-beam divergence from an ACC is reduced from its symmetric rocking-curve width by the square root of m, while the acceptance angle is enlarged by the same factor. This fact has been discussed by Kohra(1962), Warren(1969), and more recently by Kuriyama & Boettinger(1976). Therefore, with an ACC in its magnifying mode, one can produce a parallel beam of X-rays with a theoretical angular divergence of the order of one second of arc. At the detector's end, another matched ACC is used in its demagnifying mode such that an acceptance angle of one second of arc is achieved. When the system is operated in a non-dispersive configuration, we have measured a convoluted rocking-curve width of 2 seconds of arc which is 33% larger than the theoretical value of 1.5 seconds (Fig. 1). The measured reflectivity is 60%. This double ACC 'slit' system (Fig. 2) can be used for high-resolution small/wide-angle scattering measurements. The second ACC, acting as an ideal receiving slit only receives photons coming within 2 seconds of arc about the desired scattering angle. Particularly for the small-angle scattering application, this system enables one to obtain measurement within the direct beam extremely close to the direct beam direction (*i.e.* $2\theta=0°$).

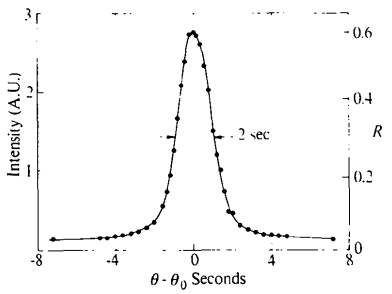

Fig. 1. A rocking curve obtained by the non-dispersive arrangement of two asymmetric crystals. The curve was obtained by rotating the second crystal only. The letter R represents the amount of reflectivity.

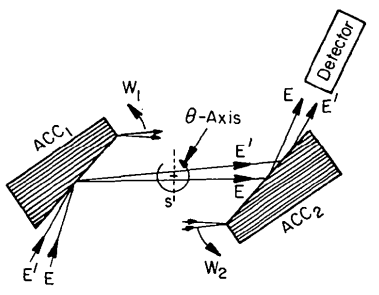

Fig. 2. Arrangement of the two asymmetric crystals.

HAYDN CHEN

Department of Metallurgy and Mining Engineering and Materials Research Laboratory
University of Illinois
Urbana
IL 61801
USA

MASAO KURIYAMA

Metallurgy Division
National Bureau of Standards
Washington
DC 20234
USA

(*Received* 21 *August* 1980; *accepted* 4 *February* 1981)

References

Kohra, K. (1962). *J. Phys. Soc. Jpn*, **17**, 589-590.

Kuriyama, M. & Boettinger, W. J. (1976). *Acta Cryst.* A**32**, 511-512.

Warren, B. E. (1969). *X-ray Diffraction*, Ch.14. Reading, Mass: Addison-Wesley.

Crystallographers

This section is intended to be a series of short paragraphs dealing with the activities of crystallographers, such as their changes of position, promotions, assumption of significant new duties, honours, etc. Items for inclusion, subject to the approval of the Editorial Board, should be sent to the Executive Secretary of the International Union of Crystallography (J. N. King, International Union of Crystallography, 5 Abbey Square, Chester CH1 2 HU, England).

Professor **D. H. Templeton,** Lawrence Berkeley Laboratory, University of California, USA, has been appointed as a Co-editor of *Acta Crystallographica* to succeed Professor **E. C. Lingafelter,** who has been a Co-editor of the journal since 1975.

Sir **Charles Frank**, H. H. Wills Physics Laboratory, University of Bristol, England, has been awarded the 1981 Gregori Aminoff Prize by the Royal Swedish Academy of Sciences for his contributions to the knowledge about the mechanisms of crystal growth. He received the Prize at the June meeting of the Academy and in this connection gave a lecture 'The Growth of Snow Crystals'. This is only the second time the Aminoff Prize has been awarded, the first recipient being Professor **P. P. Ewald** in 1979. The Academy notes that Sir Charles has worked within a field that was of particular interest to Gregori Aminoff and solved the structural problems with an elegance that Aminoff would have highly appreciated.

Books Received

The following books have been received by the Editor. Brief and generally uncritical notices are given of works of marginal crystallographic interest; occasionally a book of fundamental interest is included under this heading because of difficulty in finding a suitable reviewer without great delay.

J. Appl. Cryst. (1981). **14**, 280

Crystal structures of clay minerals and their X-ray identification. Edited by *G. W. Brindley* and *G. Brown*. Pp. 495. London: Mineralogical Society, 1980. Price £28.00, US$70.00. A review of this book, by Lisa Heller-Kallai, has been published in the July 1981 issue of *Acta Crystallographica*, Section B, pages 1481-1482.

Computer processing of electron microscope images. Edited by **P. W. Hawkes.** Pp. vi+296. Berlin, Heidelberg, New York: Springer-Verlag, 1980. Price DM 65.00, US$36.40. A review of this book, by A. M. Mikhailov, has been published in the July 1981 issue of *Acta Crystallographica*, Section A, page 606.

0021-8898/81/040280-01$01.00