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A graphical aid for calculating structure factors.

By Luigi Cavalca and Mario Nardelli, *Structural Chemistry Laboratory, Chemical Institute, University of Parma, Italy.*

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The following is a very simple method used in our laboratory for the graphical evaluation of products of the form

$$\begin{matrix}\cos\\ \sin\end{matrix}(2\pi hx)\ \begin{matrix}\cos\\ \sin\end{matrix}(2\pi ky)\ .$$

A chart is drawn with 101 equidistant parallel lines, intersected by a single perpendicular line graduated from 0 to 1·0 (Fig. 1). For each pair of x, y coordinates the values of

$$\begin{matrix}\cos\\ \sin\end{matrix}(2\pi hx) \quad \text{and} \quad \begin{matrix}\cos\\ \sin\end{matrix}(2\pi ky)$$

are read from tables. The values for

$$\begin{matrix}\cos\\ \sin\end{matrix}(2\pi hx)$$

are marked on a paper strip placed against the scale; they are labelled with the corresponding value of h and the sign, and the extreme positions of the scale are also marked on the strip.

To obtain the products

$$\begin{matrix}\cos\\ \sin\end{matrix}(2\pi hx)\ \begin{matrix}\cos\\ \sin\end{matrix}(2\pi ky)$$

for a fixed value of k the 1·0 position on the strip is placed against the

$$\begin{matrix}\cos\\ \sin\end{matrix}(2\pi ky)$$

value on the scale and the 0 position is placed on the zero line of the chart. The required product is read with the aid of the parallel lines for each h position on the strip. The signs of the products are determined immediately from the labelled signs and from the sign of

$$\begin{matrix}\cos\\ \sin\end{matrix}(2\pi ky).$$

The chart can be conveniently made from the pattern on a recorder chart. With a scale of 25 cm. for 100 divisions the third decimal figure can be obtained, and for greater accuracy the scale can be subdivided further.

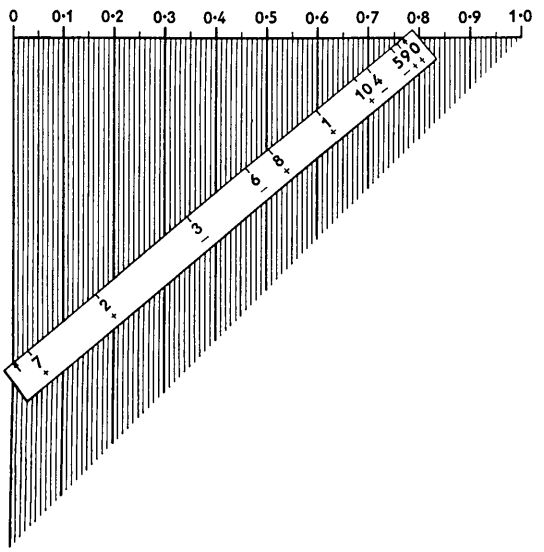

Fig. 1. Graphical evaluation of $\cos(2\pi hx)\cos(2\pi ky)$ for $x = 0{\cdot}108$, $y = 0{\cdot}537$, $h = 0, 1, \ldots, 10$, $k = 2$. As $\cos(2\pi ky) = -0{\cdot}767$ the signs of the products are opposite from those recorded on the strip.

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A new intermediate phase in the niobium-aluminum system.

By C. R. McKinsey and G. M. Faulring, *Metals Research Laboratories, Union Carbide Metals Company, Division of Union Carbide Corporation, Niagara Falls, New York, U.S.A.*

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Two AB_3 intermediate phases in the niobium–aluminum system have been reported. $NbAl_3$ is tetragonal, with $a_0 = 5{\cdot}438$, $c_0 = 8{\cdot}601$ Å, and $c/a = 1{\cdot}582$ (Brauer, 1939), while Nb_3Al is a cubic, beta-tungsten structure with $a_0 = 5{\cdot}187 \pm 0{\cdot}002$ Å (Wood *et al.*, 1958). Corenzwit (1959) has reported the existence of an additional compound, tentatively identified as a sigma phase and believed to have a higher aluminum content than Nb_3Al. The present note confirms the existence of a sigma phase in this system and places its composition at approximately 34 atomic per cent aluminum (Nb_2Al).

Alloys containing 24·4, 28·8 and 34 atomic per cent aluminum (8·6, 10·5, and 13·0 weight per cent aluminum) were prepared from niobium roundels (0·021 weight per cent carbon, 0·04 weight per cent oxygen, and 0·017 weight per cent nitrogen) and high-purity aluminum by arc melting with a non-consumable electrode. Each 50 g. charge was remelted several times to obtain a homogeneous alloy. Since all three compositions were brittle in the as-cast condition, powder samples were easily prepared by crushing and grinding.

Powder X-ray diffraction patterns of the as-cast