TABLE 1. Values of the Indices hkl of the Quantities f_i and the Function $\mathcal{K}[f]_g$

(hkl)	$[f_1, f_2, f_3]$	$\mathcal{K}[f]_g$
400	1, 0, 0	$\frac{1}{c_{11}}$
040	0, 1, 0	$\frac{1}{c_{22}}$
040	1, 0, 0	$\frac{1}{c_{66}}$
040	$\frac{1}{\sqrt{2}}$, $\frac{1}{\sqrt{2}}$, 0	$\frac{2(c_{11}+c_{66})}{c_{11}(c_{22}+c_{66})+c_{22}c_{66}-2c_{12}c_{66}-c_{12}^2}$
006	0, 0, 1	$\frac{1}{c_{33}}$
006	1, 0, 0	$\frac{1}{c_{55}}$
006	0, 1, 0	$\frac{1}{c_{44}}$
006	0, $\frac{1}{\sqrt{2}}$, $\frac{1}{\sqrt{2}}$	$\frac{2(c_{22}+c_{44})}{c_{22}(c_{33}+c_{44})+c_{33}c_{44}-2c_{23}c_{44}-c_{23}^2}$
006	$\frac{1}{\sqrt{2}}$, 0, $\frac{1}{\sqrt{2}}$	$\frac{2(c_{11}+c_{55})}{c_{11}(c_{33}+c_{55})+c_{33}c_{55}-2c_{13}c_{55}-c_{13}^2}$

In order to determine the nine elastic constants of gallium it is necessary to have measurements of the intensity of the diffuse x-ray scattering in nine different linear sections close to the reciprocal lattice points. The choice of the points and the directions was made in accordance with the calculations given by Wooster [3] for rhombic crystals. In Table 1 of this paper we list the (hkl) indices of the points investigated and the direction cosines of the

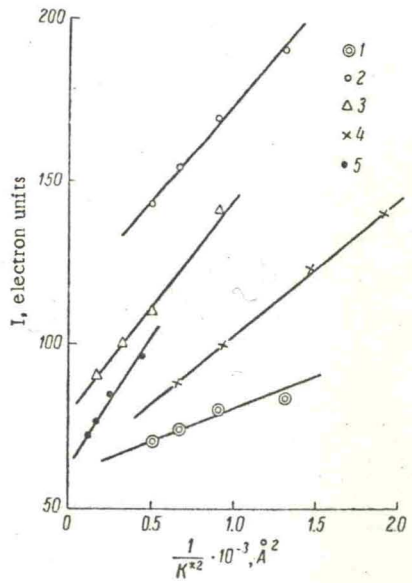

Fig. 1. The intensity of the diffuse scattering from (400) (1), (040) (2), (006) (3-5) in the directions [100] (1-3), [001] (4) and [1/√2, 0, 1/√2] (5).

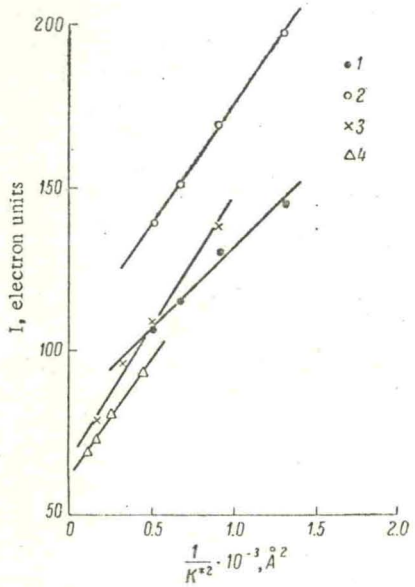

Fig. 2. The intensity of diffuse scattering from (040) (1, 2) and (006) (3, 4) in the directions [010] (1, 3), [1/√2, 1/√2, 0] (2), and [0, 1/√2, 1/√2] (4).

wave vector (f) and also the corresponding expressions for the function $\mathcal{K}[f]_g$.

The measured diffuse scattering intensity after introduction of corrections for the inclination of the sample and the polarization of the radiation was reduced to electron units by comparing it with the intensity of scattering by fused quartz. The absolute values of the intensity for each of the nine linear sections were plotted on graphs as functions of $(1/K^{*2})$ (Figs. 1 and 2). Using the method of least squares we found the inclinations of the straight lines $I(1/K^{*2})$ which define the values of the functions $\mathcal{K}[f]_g$, and consequently the elastic constants.

The values obtained for the elastic constants of gallium (dyn/cm^2) were equal to

$$c_{11} = (17 \pm 1) \cdot 10^{11}, \quad c_{66} = (6.2 \pm 0.5) \cdot 10^{11},$$
$$c_{22} = (7.4 \pm 0.6) \cdot 10^{11},$$
$$c_{12} = (2.7 \pm 0.1) \cdot 10^{11},$$
$$c_{33} = (8.8 \pm 0.4) \cdot 10^{11}, \quad c_{13} = (4.8 \pm 0.2) \cdot 10^{11},$$
$$c_{44} = (4.6 \pm 0.3) \cdot 10^{11}, \quad c_{23} = (1.7 \pm 0.1) \cdot 10^{11},$$
$$c_{55} = (5.4 \pm 0.4) \cdot 10^{11}.$$

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