they find complete agreement between their observations and calculations from the Jahn formula. Thus the thermal-vibration theory is confirmed, but the question still remains as to why the photographic method did not give the same result.

Why, in fact, did Garrido find regions shaped like a square cross instead of like a circular bun with a slightly depressed middle? Could it have been disorder or distortion in his crystals, or is the photographic method unreliable?

One of us (M.S.A.) has repeated some of Garrido's photographic observations and has also taken some other photographs. Those taken in the same crystal orientation (but with filtered Mo $K\alpha$ radiations, so that the photographs are much clearer) give pictures exactly like those published, with interpretative diagrams, in the Madrid paper. But we disagree with Garrido's deductions from them, for the following reasons:

(1) Garrido's photographs were taken in various crystal orientations relative to the incident X-ray beam, but in every case with the [100] axis vertical. The (100) plane is therefore horizontal and parallel to the X-ray beam, but the sphere of reflexion cuts the diffuse 200 domain, so that the D 200 reflexion always appears, and *it is found to be unchanged for different crystal settings*. Now these observations show that the 200 diffuse-scattering domain is shaped like a circular bun, perpendicular to the [100] reciprocal-lattice vector (Fig. 1 (a)). If it had been shaped like a cross, as Garrido suggested, the D 200 spot would have been doubled in orientations where the X-ray beam is nearly along $\langle 011\rangle$ (Fig. 1 (b)). This is *not* the case (cf. Fig. 32 of the Madrid paper, Laue diagram 595, Plate VI, taken with the X-ray beam at 48° 30′ from the cube axis).

(2) A further independent test of this point could have been made by taking photographs with the [110] axis (or any diagonal direction) vertical. If the shape of the regions had been that given by Garrido, such photographs would have shown a doubling of *all* diffuse spots (Fig. 1 (c)). Since the shape is in fact that of a circular bun, the diffuse spots are unchanged in appearance whatever axis in the 001 reciprocal net is vertical.

(3) A further test of the proposed domains may be made by examining the *height* of the diffuse spot. (In the case of 020 (Figs. 36 and 37, Madrid paper), this would be its dimension parallel to [100], the axis about which the crystal was being rotated.) If the shape of the domain had been cruciform, the 020 diffuse spot would have been oval or circular and of constant intensity at the perimeter until the Bragg reflecting position was nearly reached, when there would have been an abrupt elongation (still with constant intensity at the perimeter) to a shape about eight times the original height, but of the same width. The result would have been a marked *streaking* in these positions only; such a streaking does not occur, for this or any other reflexion.

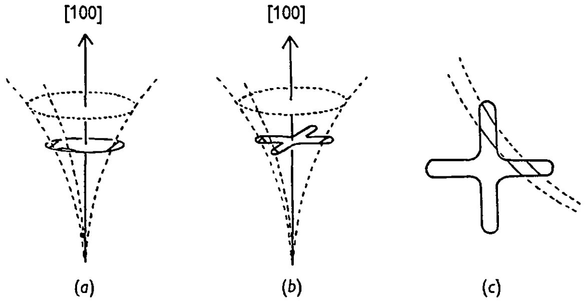

Fig. 1. (a) When the 100 domain is circular, the D 200 reflexion is unchanged as the sphere of reflexion moves round. (b) When the 100 domain is cruciform, the D 200 reflexion should sometimes be doubled, sometimes single. (c) A doubling of the diffuse reflexions is also to be expected when a diagonal axis is vertical.

We find, in fact, that both Garrido's photographs and ours lead to the shape of the diffuse scattering regions predicted by the Jahn formula, using the latest values of the elastic constants (Lonsdale, 1948). This conclusion has now been accepted by Dr Garrido (private communication). It is not necessary to use exceptionally good crystals for the photographic method; it is far more important to clear the background of the photographs from fog, due to air scattering of short wave-lengths and other extraneous effects, so that the exact shape, extent and intensity of the diffuse scattering due to the $K\alpha$ radiation only can be clearly distinguished.

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Acta Cryst. (1950). **3**, 242

Crystallography of rhombohedral sulfur.

By Clifford Frondel and R. E. Whitfield, *Harvard University, Cambridge, Mass., U.S.A.*

(*Received* 13 *December* 1949)

The existence of a rhombohedral polymorph of sulfur has been earlier established by Engel (1891) and by Aten (1914). Friedel (1891) found Engel's crystals to be hexagonal prisms terminated by a flat rhombohedron. Crystals prepared by one of us (R.E.W.) using Aten's method of crystallization from toluene solution were hexagonal prisms doubly terminated by a rhombohedron with $\rho = 24° 25' \pm 15'$. During crystallization, both the rhombohedral and orthorhombic polymorphs may deposit simultaneously, together with films of plastic sulfur. The rhombohedral crystals have an orange-yellow to pale orange-brown color, and differ in this respect from the greenish yellow to yellow color of the orthorhombic polymorph. No cleavage was observed and the fracture is uneven to subconchoidal. The hardness is about 2. Optically the crystals are uniaxial negative and are weakly dichroic with absorption $O > E$. Study of the crystals is greatly hindered by the rapidity with which they break down into plastic sulfur. A perceptible surface film of plastic sulfur is formed on the crystals in a few minutes after they are exposed to air, and the crystals are largely converted after an hour or so. The plastic-sulfur stage is accompanied by a relatively slow recrystallization into orthorhombic sulfur. Hard, polycrystalline pseudomorphs are formed after a day or so. The rate of breakdown, relatively slow if the crystals are kept in the dark in the mother liquid, is markedly accelerated by exposure to X-rays.

X-ray powder photographs could not be obtained. Single crystals examined by the Weissenberg and rotation methods gave a cell with $a_0=10{\cdot}9$, $c_0=4{\cdot}26$ kX. in hexagonal coordinates ($a_0:c_0=1:0{\cdot}392$). The unit cell contains 18 atoms of S; the calculated gravity is 2·17 and the measured gravity (Engel) is 2·135. The measured gravity of orthorhombic sulfur is 2·07. The crystal forms observed are $\{11\bar{2}0\}$ and $\{10\bar{1}1\}$ in the orientation and unit of the structure cell ($a:c=1:0{\cdot}393$, morphology). A Weissenberg zero-layer photograph about [0001], very poor in quality, indicated this axis to be three-fold without vertical planes of symmetry. This observation and the crystal habit indicate the point symmetry to be $\bar{3}$ (trigonal rhombohedral class). The lattice type, which may be hexagonal or rhombohedral in this crystal class, could not be decided upon from the available X-ray photographs. It may be noted that this polymorph of sulfur is not isostructural with the hexagonal (32) polymorphs of selenium and tellurium.

References

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Acta Cryst. (1950). **3**, 243

Corrigenda: The molecular structure of thiophthen from X-ray crystal analysis.

By E. G. COX R. J. J. H. GILLOT and G. A. JEFFREY. *Department of Inorganic and Physical Chemistry, The University of Leeds, England.*

(*Received* 4 *February* 1950)

In discussing the accuracy of the structure analysis (Cox, Gillot & Jeffrey, 1949) we omitted a factor of $1/\sqrt{2}$ from the calculation of the standard deviations of the carbon peak positions. The values given on p. 361 should read

$$\sigma_x=0{\cdot}0085,\quad \sigma_y=0{\cdot}0085,\quad \sigma_z=0{\cdot}0113\ \text{A}.$$

A compensating error of omission was made in the formula for the significance tests, which should read

$$P=\tfrac{1}{2}-\tfrac{1}{2}\,\mathrm{erf}\,[\Delta/(\sqrt{2})\,\sigma].$$

The values given in Table 6 therefore remain unchanged, as does the subsequent discussion of accuracy based on the significance tests.

Reference

COX, E. G., GILLOT, R. J. J. H. & JEFFREY, G. A. (1949). *Acta. Cryst.* **2**, 356.

Acta Cryst. (1950). **3**, 243

Vector sets, a correction.

By M. J. BUERGER, *Crystallographic Laboratory, Massachusetts Institute of Technology, Cambridge, Massachusetts, U.S.A.*

(*Received* 3 *March* 1950)

An error occurs in Table 1 (Buerger, 1950). Fourteen space groups appear in the middle column, opposite the entry $C\bar{3}1m$ in the right column of the table. The entry $C\bar{3}1m$ should pertain to only seven space groups, the remaining seven pertaining to an additional entry $C\bar{3}m1$. The correct arrangement for these two columns is

$C31m$, $C31c$; $C312$, $C3_112$, $C3_212$; $C\bar{3}1m$, $C\bar{3}1c$	$C\bar{3}1m$
$C3m1$, $C3c1$; $C321$, $C3_121$, $C3_221$; $C\bar{3}m1$, $C\bar{3}c1$	$C\bar{3}m1$

The details of distinguishing space groups in their vector representation is treated elsewhere. All space groups can be distinguished except between members of the enantiomorphic pairs.

Reference

BUERGER, M. J. (1950). *Acta Cryst.* **3**, 87.

Acta Cryst. (1950). **3**, 243

International Union of Crystallography

Second General Assembly and International Congress, Stockholm, 27 June–3 July 1951

By kind invitation of the Swedish National Committee for Crystallography the Second General Assembly and International Congress of the Union will be held in Stockholm from 27 June to 3 July 1951. These dates have been chosen in consultation with the Swedish National Committee and with the National Committees of all the Adhering Bodies. A Local Committee has been established in Stockholm under the Chairmanship of A. WESTGREN, Vice-President of the Union, with F. E. WICKMAN as Secretary.

Membership

Delegates to the General Assembly, which will be concerned with the formal business of the Union, will be nominated by the National Committees. Crystallographers throughout the world are, however, cordially invited to attend the International Congress; it is particularly hoped that they will assist the Union by bringing the Congress to the notice of their colleagues, by press announcements and otherwise, so that the attendance