$$q_{11} = 70{\cdot}21\times10^{-13} \quad\text{and}\quad \tfrac{1}{2}(q_{12}+q_{13}) = 80{\cdot}52\times10^{-13}\ \text{cm.}^2\ \text{dyne}^{-1}.$$

(*c*) *Evaluation of the strain-optical constants*

The four strain-optical constants are calculated from the standard equations connecting the p's, q's and the elastic constants. They are cited in Table 4.

4. Discussion of results

The stress-optical and strain-optical constants of barium and lead nitrates are given in Table 4. The values obtained earlier (Bhagavantam & Suryanarayana, 1948) for some of the constants of barium nitrate are

$$(q_{11}-q_{12}) = -23{\cdot}81\times10^{-13},\ (q_{11}-q_{13}) = -18{\cdot}06\times10^{-13}$$
$$\text{and}\quad q_{44} = -1{\cdot}62\times10^{-13}\ \text{cm.}^2\ \text{dyne}^{-1}.$$

Table 4(*a*). *Stress-optical constants*

(Units of 10^{-13} c.g.s.)

	$q_{11}-q_{12}$	$q_{11}-q_{13}$	q_{44}	q_{11}	q_{12}	q_{13}
Barium nitrate	−23·84	−17·13	−1·69	18·11	40·0	35·2
Lead nitrate	−19·13	−11·84	−1·39	70·21	89·34	82·05

Table 4(*b*). *Strain-optical constants*

	$p_{11}-p_{12}$	$p_{11}-p_{13}$	p_{44}	p_{11}	p_{12}	p_{13}
Barium nitrate	−0·992	−0·713	−0·0205	2·49	3·40	3·20
Lead nitrate	−0·281	−0·174	−0·0191	8·50	8·78	8·67

There is good agreement between these values and the values obtained in the present investigation.

The results show that the difference between $(q_{11}-q_{12})$ and $(q_{11}-q_{13})$ is fairly large in both barium and lead nitrates, being about 39% and 60% of the lower value respectively. Both the substances are highly anisotropic, the birefringence produced by a pressure along a cube axis being nearly fourteen times that produced by an equal pressure along a cube diagonal. The values of the photo-elastic constants of both the substances are very large in comparison with many other crystals; in fact the values of the individual constants of lead nitrate are the largest recorded so far in crystals.

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Short Communications

Contributions intended for publication under this heading should be expressly so marked; they should not exceed about 500 *words; they should be forwarded in the usual way to the appropriate Co-editor; they will be published as speedily as possible; and proofs will not generally be submitted to authors. Publication will be quicker if the contributions are without illustrations.*

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Deterioration of the crystallinity of wet ribonuclease with exposure to X-radiation.

By BEATRICE S. MAGDOFF, *Polytechnic Institute of Brooklyn, Protein Structure Project, 55 Johnson Street, Brooklyn 1, N.Y., U.S.A.*

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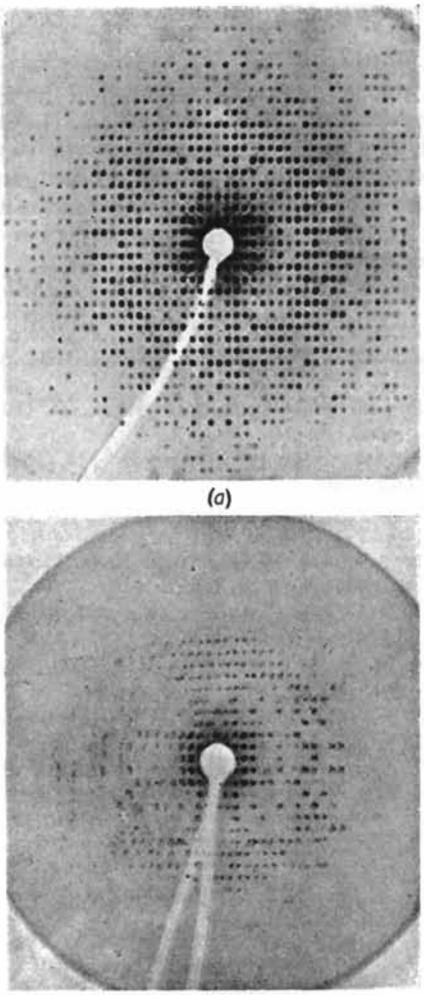
During the recording of the X-ray diffraction pattern of wet monoclinic ribonuclease (cell dimensions: $a = 30{\cdot}3$, $b = 38{\cdot}3$, $c = 53{\cdot}5$ Å, $\beta = 105{\cdot}8°$, grown from n-PrOH, at pH 6, by Dr M. V. King of this laboratory), it was observed that the intensities of the diffraction spots decreased after many hours of X-ray exposure. Such an effect was observed by Kendrew (1949) while examining the pattern of myoglobin.

To investigate the changes in the pattern with X-ray exposure, a freshly grown crystal was mounted and the precession diagram from one zone (0*kl*) was used as a standard against which to check the variations of the intensities of the X-ray reflections. Two films, taken after 11 hr. and after 143 hr. of irradiation of the crystal, respectively, showed identical diagrams. A film, started after the crystal had been irradiated for 185 hr., showed a very weak pattern. Not only were the intensities low, but the pattern was distorted in such a way as to indicate that the crystal was no longer oriented. Even though the effect of X-ray exposure must be cumulative, the films indicate that the deterioration of the diffraction pattern occurs precipitously (in this case, somewhere between 180 and 190 hr. of exposure).


(a)

(b)

Fig. 1. (*a*) Diffraction diagram, with the exposure started after 11 hr. of previous irradiation. (*b*) Diagram of the same zone, with the exposure started after 204 hr. of previous irradiation.

The crystal was reoriented, the shift in the axis of oscillation being about 1°, and another diagram, to compare with the standard, was recorded. Fig. 1(*a*) shows the film started after 11 hr. of previous irradiation of the crystal; Fig. 1(*b*), the film after the reorientation. The spots in Fig. 1(*b*) are all less intense than those in Fig. 1(*a*) by approximately the same ratio, and the reflections for small values of d are not observed. The absence of streaks and diffuse rings in Fig. 1(*b*) precludes a large disordering of the lattice, despite the disappearance of reflections at large angle. A decrease in the quantity of scattering matter in the X-ray beam would produce a similar weakening of the pattern.

Examination of the crystal under the microscope (Fig. 2) shows a circular cylinder of different transparency, color and reflectivity from the rest of the crystal. Between crossed polaroids high-order interference colors were seen, except at the circular section which had been exposed to X-rays. The 'punched out' part has a diameter of $(0{\cdot}55 \pm 0{\cdot}01)$ mm., and that of the X-ray beam at the crystal is $(0{\cdot}56 \pm 0{\cdot}01)$ mm. At the bottom of the crystal a fracture appeared. Five weeks later, the fracture line extended around the right-hand side of the circle and joined with that in the upper right-hand corner. Jolting the crystal in the capillary, in which it was mounted, split it along the fracture and the split followed half way around the circumference of the circle.

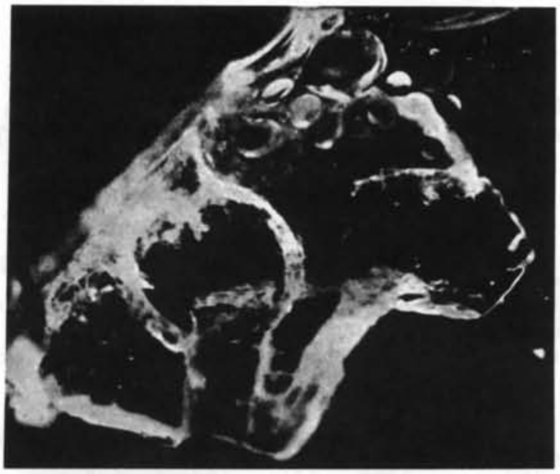


Fig. 2. The crystal under the microscope. The circle that appears 'punched out' is 0·55 mm. in diameter.

That the changes in the intensities of the X-ray reflections are due to X-ray exposure is shown by a film of the standard zone taken with the beam striking the upper right hand corner of the crystal. This film, of a previously unexposed part of the crystal, is identical with the first film of the same zone from the part of the crystal which subsequently deteriorated.

All exposures were made with the crystal at 10·5 cm. from the target of a General Electric CA–7 copper-anode X-ray tube operated at 40 kV. and 20 mA. A nickel filter, 0·008 mm. thick, was used.

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