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The lattice constant of caesium iodide.

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A new determination has been made of the lattice constant of caesium iodide which is more accurate than the earlier one of Davey (1923). No significant difference was found between samples purchased at an interval of several years. The most likely impurities in this material are other alkalis and halogens. Chemical tests by Dr P. F. Holt of Reading University failed to detect the presence of halogens other than iodine. Spectroscopic examination by the National Physical Laboratory showed the presence of 0·01 % Na and K and 0·03 % Rb.

Powder patterns using Cu $K\alpha$ radiation were obtained with a 19 cm. diameter Unicam camera calibrated by direct measurement of the diameter and knife-edges. The camera was specially adapted so that the temperature of the specimen could be controlled to well within 0·2° C. Since the linear expansion coefficient of CsI is $4{\cdot}86 \times 10^{-5}$/° C., the uncertainty in the temperature represents less than 1 part in 10^5 in the lattice constant.

From three to eight resolved $\alpha_1\alpha_2$ doublet lines were measured on each film. Following the procedure of Nelson & Riley (1945), specimen absorption was allowed for by plotting the apparent value of the lattice constant a for each doublet (arithmetic mean of the a values found from the α_1 and α_2 components) against

$$\tfrac{1}{2}\,(\cos^2\theta/\sin\theta + \cos^2\theta/\theta).$$

The best straight line was fitted by least-squares and extrapolated to $\theta = 90°$. The extrapolated value, a_0, of a was then corrected for refraction. The technique was tested by making measurements on pure NaCl. Three films gave a value for the lattice constant of this material of $5{\cdot}6400 \pm 0{\cdot}0001$ A. in good agreement with the standard value $5{\cdot}64006 \pm 0{\cdot}00006$ A. (Bergen, 1941).

Six measurements have been made with CsI at temperatures between 22° and 36° C. The linear coefficient of expansion calculated from these was $4{\cdot}86 \times 10^{-5}$/° C., in exact agreement with the result of dilatometric measurements (Baxter & Wallace, 1916). Using this value to correct all our measurements to 20° C., we find

Lattice constant of CsI at 20° C. = 4·5667 A.

This is in terms of the standard wave-lengths

Cu $K\alpha_1 = 1{\cdot}54050$ A., Cu $K\alpha_2 = 1{\cdot}54434$ A.

The error of a single determination, estimated both from the scatter of the points on the Nelson–Riley extrapolation and from the scatter of the results from the different films, is appreciably less than one unit in the last figure, and we believe the result quoted may be relied on to within this limit.

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A quick method of determining the density of liquid mixtures.

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Crystallographers frequently determine the density of crystals by flotation in heavy liquid mixtures. The density of the liquid has then to be found, usually by means of a density bottle. At least 5 cm.^{3} of liquid are required, and the determination takes some time.

A more rapid method, which needs as little as 0·1 cm.^{3} of liquid, involves measuring the refractive index on a suitable refractometer. Both the refractive index and density of liquid mixtures are approximately proportional to the quantity of each component, so that calibration curves of refractive index against density can be drawn up. The temperature coefficients of refractive index and density approximately compensate each other so that only one curve is necessary for normal use.

A suitable mixture for many crystals is methylene iodide and benzene; the refractive index/density values for such mixes are given in Table 1. Using a curve prepared from this table, the density of any mixture of methylene iodide and benzene may be obtained in less than a minute by using a direct-reading refractometer such as the Abbé.

Table 1. *Refractive index and density of methylene iodide–benzene mixtures*

Refractive index at 20° C.	Density at 20° C. (g. cm.$^{-3}$)
1·740	3·316
1·717	3·008
1·700	2·958
1·678	2·759
1·665	2·651
1·643	2·431
1·625	2·236
1·609	2·072
1·588	1·886
1·574	1·728
1·555	1·537
1·538	1·332
1·519	1·109
1·501	0·877