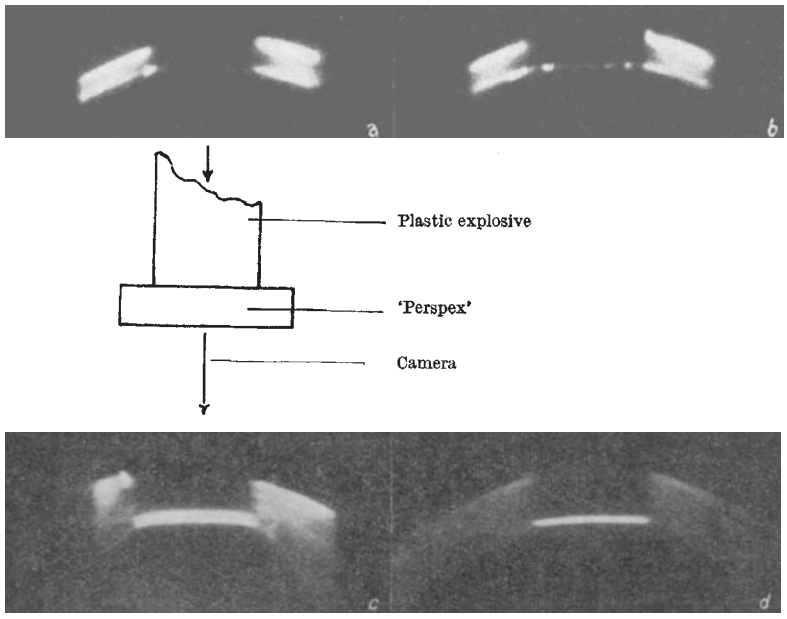


Fig. 3. End-on photographs through 'Perspex' blocks: (*a*) plastic explosive, end plane; (*b*) plastic explosive, end scratched; (*c*) plastic explosive and common salt; (*d*) *PETN*

compression of the air pockets between the explosive grains. This confirms the theory referred to above, and simultaneously casts doubt on any estimate of reaction time in terms of the duration of luminosity.

The high-speed photographs were taken by Mr. J. King, to whom my thanks are due.

STEWART PATERSON

Research Department,
Nobel Division,
Imperial Chemical Industries, Ltd.,
Stevenston, Ayrshire.
Nov. 9.

[1] Muraour, H., *Chimie et Industrie*, **47**, 3 (1942), where a bibliography of earlier papers on the subject is given. *Mémorial de l'Artillerie française*, **20**, 141, 405, 675 (1946); **23**, 867 (1949); *C.R. Acad. Sci. Paris*, **224**, 695 (1947); "Cahiers de Physique", **29–30**, 51 (1947).

[2] Cybulski, W. B., Payman, W., and Woodhead, D. W., *Proc. Roy. Soc.*, A, **197**, 51 (1949).

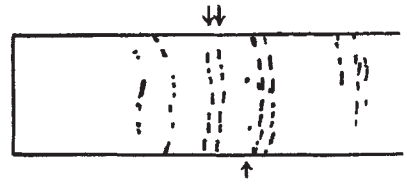
New Approaches to the Interpretation of X-Ray Powder Photographs

THE interpretation of powder photographs, despite recent attempts at systematization[1–3], remains still largely an art, and any aids towards simplification are greatly to be welcomed. We have discovered that some help can be given by photographs that are usually classed as 'poor', in the sense that the grain size of the specimen is large and the lines are therefore rather 'spotty'.

A general advantage of such photographs is that they give some idea of the multiplicity factors[4] of the reflexions; if the number of spots contributing to a particular line is abnormally small, one can be reasonably sure that the multiplicity factor is small, and therefore that the indices are fairly simple—for example, *h*00. This is illustrated by the accompanying diagram, which is a diagrammatic representation of the first few lines of a powder photograph of the alloy CdMg; the line marked with the lower arrow is more sparsely populated than its neighbours and therefore is likely to be of the type *h*00.

A point of more limited application also arises from the photograph: the two lines marked by the upper arrows have the same general appearance, and we may therefore deduce that they have a common origin, as for certain lines given by the alloy FePt[5]. This is possible because at high temperatures the alloy CdMg is hexagonal[6], and the structure we are concerned with is formed by transformation at a lower temperature. The two lines are near the position of the line $10\bar{1}0$ given by the close-packed hexagonal structure, and so we may guess that the structure is orthorhombic, the indices of the lines being 110 and 200[7].

If this guess is correct, the values of the reciprocal constants a^* and b^* are directly deducible, and since these do not correspond in any simple way to the value given by the other line considered, we may deduce that this line is 002. The three reciprocal constants thus obtained were adequate to explain all the lines on the X-ray photograph. (The actual photograph from which the values of $\sin^2\theta$ were derived was obtained from a specimen having smaller grain size; the lines, although still spotty, were much more nearly uniform than those illustrated in the drawing.) While the more systematic methods referred to would no doubt also have led to this result, the methods just described must be many times faster.



Diagrammatic representation of part of powder photograph of CdMg

The unit cell has dimensions $a = 5{\cdot}24$ A., $b = 3{\cdot}22$ A., $c = 4{\cdot}97$ A., and, from comparison with the close-packed hexagonal structure it contains two atoms of cadmium and two of magnesium. The structure is isomorphous with AuCd[8].

H. LIPSON
H. STEEPLE

Physics Department,
College of Technology,
Manchester 1.
Jan. 12.

[1] Hesse, R., *Acta Cryst.*, **1**, 200 (1948).
[2] Lipson, H., *Acta Cryst.*, **2**, 43 (1949).
[3] Ito, T., *Nature*, **164**, 755 (1949).
[4] "International Tables for the Determination of Crystal Structures", **2**, 502 (1935).
[5] Lipson, H., Shoenberg, D., and Stupart, G. V., *J. Inst. Metals*, **67**, 333 (1941).
[6] Hume-Rothery, W., and Raynor, G. V., *Proc. Roy. Soc.*, A, **174**, 471 (1940).
[7] "International Tables", **2**, 472 (1935).
[8] Ölander, A., *Z. Krist.*, **83**, 145 (1932).