

$2V$ from $2E$ and N_Y , in so far as those values are covered by the graph (Key 2).

As higher and lower values of d (or $2D$) are measured with the same degree of accuracy, linear scales are better adapted to the problem than are logarithmic ones.

It will be seen that the reading is of high accuracy, each degree of $2V$ being represented by a line. Any error made will thus be caused chiefly by the fact that the Mallard equation is an approximation.

The use of oblique interference figures

It is equally possible to measure optic angles in interference figures, in which the acute bisectrix is not well centered. Strictly speaking, the distance between the melatopes should now be measured in two parts, *i.e.* from the center of the interference figure to each of the melatopes. From these two distances $2D'$ and $2D''$ the values $2V'$ and $2V''$ should then be read separately from the chart and computed afterwards: $2V' + 2V'' = 2V$.

It is seen from the chart however that $2V$ is almost proportional to d ; therefore in practice $2D$ can be measured and used in the chart directly, just as in sections normal to the acute bisectrix. The error will be of the order of 1° or less. The optic plane, however, should be perpendicular or nearly so.

AN EASY METHOD TO OBTAIN X-RAY DIFFRACTION PATTERNS OF SMALL AMOUNTS OF MATERIAL

S. A. HIEMSTRA, *Geological Survey, Pretoria, South Africa.*

It is often desirable to prepare x-ray powder diffraction patterns of very small amounts of material. Collodion may be used to work the mineral powder to a small ball between the fingers. It requires much practice to achieve success. The resulting ball may be too large, and some material is often lost.

An easy method to prepare balls which yield good powder diffraction photographs, is as follows: Transfer the small grain, which may weigh less than 0.005 mg., or measure less than 0.1 mm. in diameter, to a clean glass slide. Cover it with a small drop of thin rubber solution (such as can be obtained in a bicycle repair kit) which has previously been placed on another glass slide. The grain can now be ground in the solution between the glass plates without losing any material. Short strokes will prevent the powder from spreading out too much. By inspection under a binocular microscope one can ascertain when the material is fine enough.

Remove the slides from each other for a few seconds to allow the rubber solvent to evaporate. Each slide will show a circular area of clear sticky rubber, with the mineral powder confined to the center of each. The clear rubber can easily be rubbed off with the finger. Put the slides on top of each other again, and with a circular motion, work the powder-rich solution to a small ball, between 0.2 and 0.5 mm. in diameter. Mount this ball on the point of a stiff hair, which has previously been wetted with rubber solution. This ball can now be mounted in the camera with the ball at the middle of the x -ray beam.

In the photograph (Fig. 1) the powder diffraction pattern of pyrite, obtained by means of an 0.2 mm. thick rod, is compared with that ob-

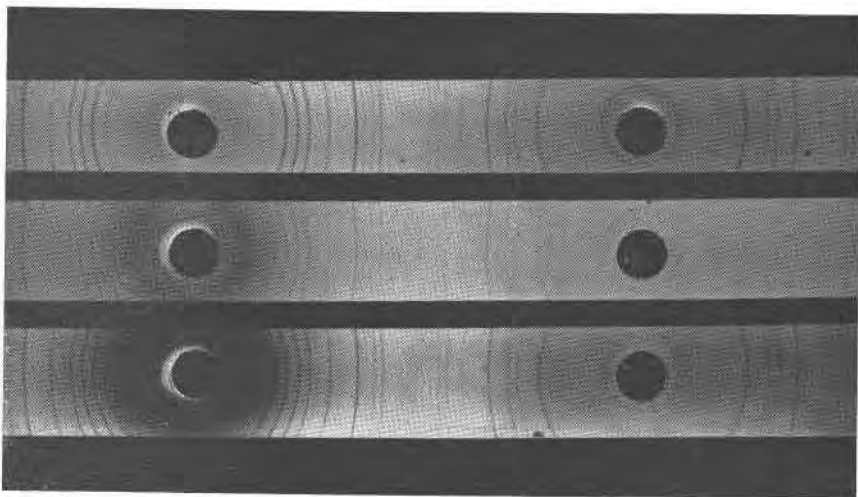


FIG. 1. Powder diffraction patterns of pyrite obtained by means of a rod, above, and rubber balls, in the middle and below.

tained by means of a rubber ball. Co-radiation produced at 20 KV and 20 ma., and cameras of 57.3 mm. diameter were used. The upper pattern was obtained by using the rod, and exposing for one hour. In the second pattern a rubber ball was used, exposing for one hour. In the third pattern the same ball was used, but exposure time was increased to two hours.

To compare the accuracy obtainable in the two cases, the upper and lower patterns were measured, and after applying corrections for the film shrinkage, the unit cells were calculated, using the five strongest back reflection lines.

The results are as follows:

$h^2+k^2+l^2$	a_0 (rod method)	a_0 (ball method)
27	5.417 Å	5.417 Å
29	5.417 Å	5.414 Å
30	5.416 Å	5.417 Å
32	5.417 Å	5.417 Å
36	5.418 Å	5.418 Å

It is evident therefore that, when using very small amounts of material in a rubber ball, the exposure time must be increased. Slightly denser backgrounds are produced. The accuracy may be a little lower.

The method is easy to apply when small amounts of material, such as single grains in heavy mineral fractions, have to be identified. By heating the ball on a platinum plate, all the rubber can be removed, and the material is then available for chemical or spectrographic examination.

A JOINT-FREE SAMPLE SPLITTER*

CHARLES R. MCKINNEY AND LEON T. SILVER, *California Institute of Technology, Pasadena 4, California.*

A sample splitter based on the Jones riffle design has been devised which incorporates certain features not found in other splitters heretofore available. The splitter was folded from one piece of sheet metal and as such has neither cracks or joints to hold up material nor joining metal such as solder to contaminate the sample. It is possible to form the splitter from such materials as plastic and paper or to line metal chutes with these materials. Several sizes of 16-chute splitters have been made in this laboratory; the smallest being made from 0.015 inch thick pure aluminum, each chute opening being $\frac{1}{2}$ inch long and $\frac{1}{8}$ inch wide. This is a microsplitter comparable to the Otto microsplitter in size. The largest splitter was made from $\frac{3}{32}$ inch thick pure aluminum, each chute opening being 3 inches long and $\frac{1}{2}$ inch wide. An isometric view of a folded 45-degree splitter is shown in Fig. 1. The term "45-degree" refers to the angle between the chute bottom and the horizontal. While 45 degrees is greater than the angle of repose, some hang-up is still experienced and cleaning is required. A 60 degree slope should be much better.

The patterns for 45 degree and 60 degree splitters are shown in Figs. 2 and 3 respectively. Referring to Fig. 2 the distance 2-3 or 5-4 will be the length of the chute opening. The distance A , which is the radius of the arcs at the corners, is computed such that the chord of the quarter

* Division of Geological Sciences, Contribution No. 784, California Institute of Technology, Pasadena 4, California.