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 $\frac{1}{32}$ 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.

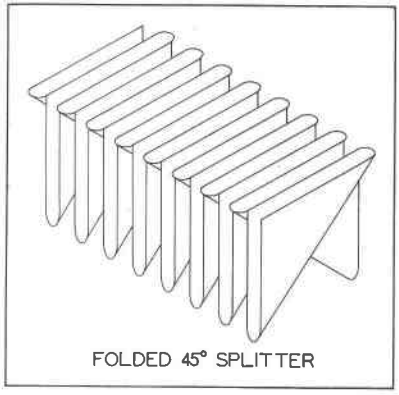

FIG. 1

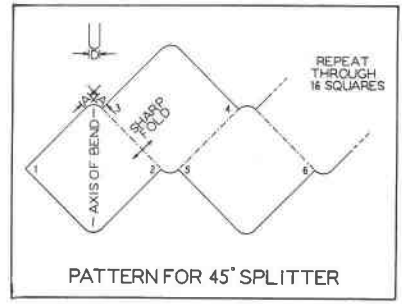

FIG. 2

circle of radius A is equal to half the circumference of a circle whose diameter is D, the spacing of the chutes. Each square is offset from the preceding one by the distance A as shown. If the thickness of the material is kept small compared to the spacing D, no allowance need be made for the length needed for the sharp fold.

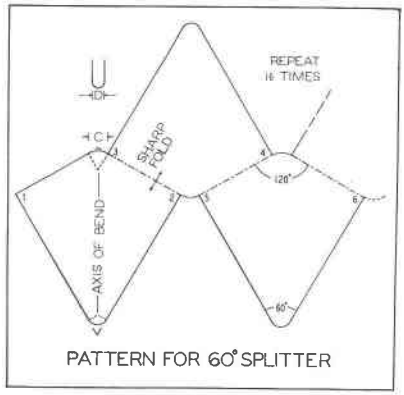

FIG. 3

Folding the splitter begins by bending the first square along the diagonal marked "axis of bend" over a block of thickness D with semicircular edge such that point 1 lies over point 2, as in closing a book. A sharp *reverse* fold is made along line 2–3. The bending block is then placed along the diagonal of the second square, parallel to the first axis of bend, and point 3 is brought over point 4. A sharp reverse fold is made along line 4–5 and the first pair of chutes has been completed. The process is then continued until the desired number of chutes is obtained.

The layout of the 60 degree splitter is similar to that of the 45 degree. The radius of the arcs at the corners being determined such that the chord C is equal to half the circumference of a circle of diameter D, the spacing of the chutes.

The design of the supports, collar and pans is optional. Our splitters are supported at each end with legs made from pure aluminum, fastened together with a single bolt passing under the crotch formed by the chutes. Collars are machined from one piece of aluminum to fit on top of the supported chute assembly. Pouring and receiving pans are also machined from one piece of aluminum to eliminate the need for joining metal. This work was performed under *AEC Contract AT(11-1)-208.*

VALIDITY OF "VEGARD'S LAW"

E-AN ZEN

Vegard and Dale (1928), in their work on binary solid solutions in the cubic system, state as an empirical rule a linear relation between unit cell edge length and composition. Since then, however, this "law" has become accepted by many as of general validity, its soundness being assumed even in non-cubic crystal systems (Chave, 1952, p. 192; Hess, 1952, p. 182). It is taken by some to hold for all ideal solid solutions; and Wasastjerna (1951, p. 2) has employed it as basis for his theory on the heat of formation of binary solid solutions.

In view of this wide publicity, it would be desirable to examine the basis of this "law" theoretically. Consider a binary solid solution in which the volume effects of the two end-members are additive, i.e., the solution shows no volume change upon mixing. Let V_1 and V_2 denote the molar volumes of the two end-members, and N the mole fraction of species 1. We then have for the volume of the solid solution,

$$\begin{aligned} V &= NV_1 + (1 - N)V_2 \\ &= N(V_1 - V_2) + V_2. \end{aligned} \tag{1}$$

In the cubic system and in terms of the unit cell edges R_1 and R_2, equation (1) becomes

$$R^3 = R_2^3\left[1 - \frac{R_2^3 - R_1^3}{R_2^3}N\right] \tag{2}$$

and

$$R = R_2\left\{1 - \left[1 - \left(\frac{R_1}{R_2}\right)^3\right]N\right\}^{1/3}. \tag{3}$$

Now suppose we write "Vegard's Law" in the form

$$R = R_2(1 + \beta N) \tag{4}$$