MODELS OF TERNARY SYSTEMS

EDWARD P. KAISER,
Mass. Institute of Technology, Cambridge, Mass.

Many students find it difficult to visualize ternary composition-temperature diagrams—often called 'Bowen diagrams'—in the usual two-dimensional form. As a teaching aid, three-dimensional models of these diagrams are desirable, but are not obtainable commercially. The following is a brief description of the technique employed to make such models.

The two-dimensional ternary diagram, with the temperature contours of the liquidus surface, is enlarged to measure twelve inches on a side. This may be done with a visual optical device, or by photostat. The final diagram should be on light paper, so that an impression may be made through it on carbon paper, as described below.

Several equilateral triangles of $\frac{3}{8}''$ plywood, twelve inches on a side, are

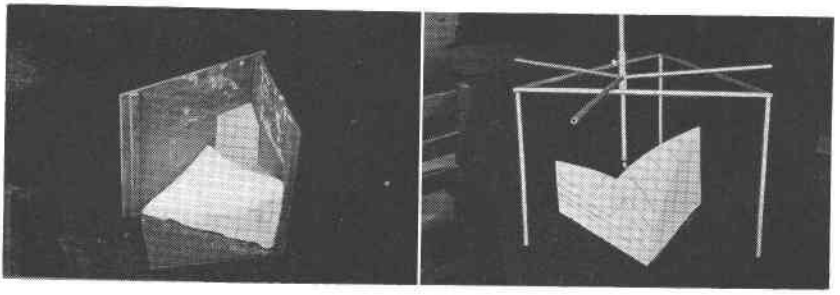

FIG. 1. Set-up ready to cast positive, showing card for corner support.
FIG. 2. Completed model of system albite-anorthite-diopside, with device for drawing contours.

procured; for the ordinary model about fifteen of these will give the requisite vertical spread, or relief, between lowest and highest points in the temperature range. Each temperature contour is now marked on a triangle of plywood, by placing a sheet of carbon paper on the wood, superposing the enlarged diagram, and tracing the desired contour. These contours are cut out on a band saw, and the resulting pieces are nailed together in proper order to form a step model of the liquidus surface. Plasticine is used to fill up the steps and produce a smooth surface. The master positive model is now complete.

From the master positive, lightly greased, a negative in plaster of Paris is made. This in turn is used to cast the final positive.

Before pouring the final positive, the writer places a thin card, folded and creased, in each corner of the mold, as shown in Fig. 1. When the

positive has hardened, this card may be stripped off and a fresh card glued in the inset thus provided. This protects the edges, yet is flush with the sides of the model.

To prevent sticking of the final positive to the plaster negative, the negative surface is coated with 'label lacquer,' a solution of celluloid in acetone. If this is done no grease need be used, and the resulting positive surface is nearly perfect, requiring a minimum of scraping.

The plaster should be mixed all at once in a large container, to a rather fluid consistency so that it may be poured in one operation and smoothed off on the surface. Annoying airholes result from casting with stiff plaster.

The model is finished by shellacking and enameling, after which the binary diagrams on the sides, and the contours on the top, are inked in.

For drawing the contours the writer used the device shown in Fig. 2. Its support is a horizontal triangle on three legs. On this rests a movable unit consisting of three rods radiating from a vertical sleeve. A rod, to which a drafting pen is fastened, fits in this sleeve. The pen used is hinged and may be adjusted to work on a surface of any degree of inclination. The pen is held at the proper height by means of a set screw in the sleeve; the movable unit may then be guided so that the pen will draw the desired contour.

Protection for the inked lines and labels is given by a final coat of varnish; the variety known as "White Damar" varnish appears to be the most satisfactory for perfect transparency. Figure 2 shows a completed model of the system albite-anorthite-diopside.

AURICHALCITE IN MISSOURI

W. D. KELLER,

University of Missouri, Columbia, Missouri.

The occurrence of aurichalcite, $2(Zn,Cu)CO_3 \cdot 3(Zn,Cu)(OH)_2$, in Missouri is unreported hitherto, so far as the writer knows, and a note concerning a recent find may be in order for the record. One of the writer's students, Mr. Carl E. Paden, collected specimens in November, 1939, from the Shinn mine in Stark City, Newton County, Missouri, (near the Joplin area), which contain aurichalcite and associated sphalerite, hemimorphite, covellite, malachite, and dolomite. The ore minerals cover and cement a chert and dolomitic limestone breccia which is also cemented by secondary crystalline dolomite showing the curved crystals and pink color typical of that mineral from the Joplin region.

The sphalerite is resinous and dark brown, and highly shattered in most parts. After fracturing, solutions permeated the formation and re-