A New Sample Container-Heater for a Tetrahedral Press

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Several methods for containing and heating a sample in a tetrahedral press have been reported,[1,2] but each requires a considerable amount of unorthodox machining with special tools. A new approach has been devised which allows the experimenter to construct a container-heater easily with tools found in every shop.

1. H. T. Hall and L. Merrill, Inorg. Chem. 2, 618 (1963)
2. J. D. Dudley and H. T. Hall, Phys. Rev. 118, 1211 (1960)

The new container-heater consists of a piece of metal foil, (Ni, Pt, etc.) in which a dimple has been formed, and this assembly is placed in a precut and drilled pyrophyllite tetrahedron.

In order to form the metal container a die was made by drilling out a dimple in a 1 3/4" aluminum slug with a 3/8" bull nose drill. A collar was placed around the aluminum slug and molten lead was poured into the cavity. The lead piece is then used as the male part of the die. A Plexiglas template was cut to outline the shape of the container. Annealed Ni or Pt foils (.005") were cut in the proper shape and hand pressed between the dies. Figure 1 shows the aluminum die with inked guide lines, the lead male die, the Plexiglas template and a dimple which has been pressed from 0.005" Ni foil.

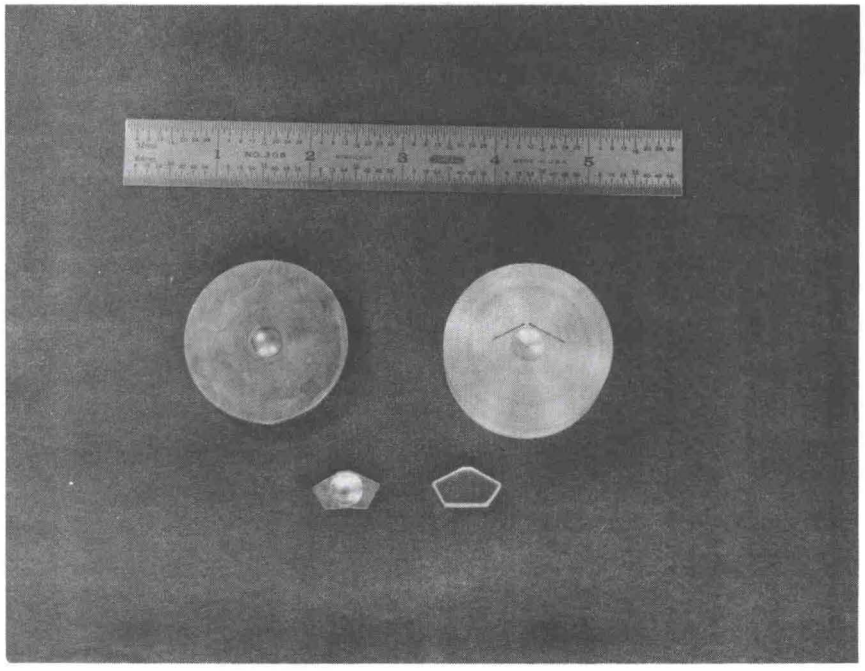

Figure I
Dies for containers, the template and a Ni dimple

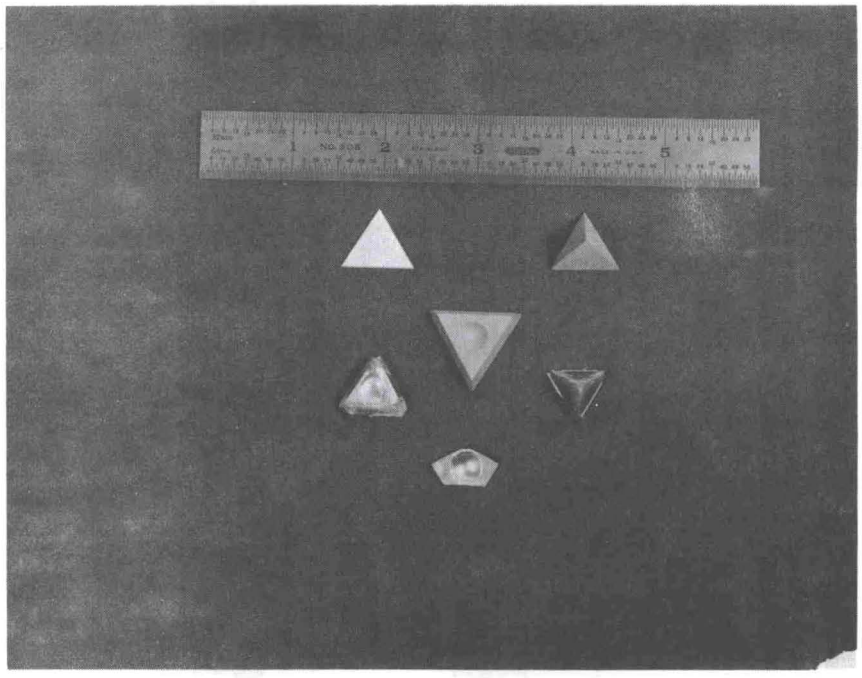

Figure II
A pyrophyllite tetrahedron ready to be used and, in the foreground, one which has been pressed to 50 Kbars at 1000°C

A 1" pyrophyllite tetrahedron is cut parallel to one of the faces and the bottom half drilled with the same 3/8" bull nose drill. The depth of this hole is fixed so that the metal container would seat properly. A pressed dimple is placed in this hole and the ends, which act as the electrical contacts, are bent over the outer faces. A BN spacer is placed over the container to separate the sample from the pyrophyllite top and replace the material lost in cutting the tetrahedron. The top is replaced and taped in place. Figure 2 shows a tetrahedron ready for loading and one which has been pressed to 20Kb and heated to 1000°C.

All cuts can be made by hand on a band saw and the holes drilled on a drill press. Among the several advantages one gains by using this method are:

1. ease of fabrication,
2. a large amount of sample can be pressed (0.1 g, but this amount is fixed by the tetrahedron and anvil sizes used),
3. the tetrahedron is easily opened intact after pressing and the sample, still in the dimple, can be removed for chemical and physical characterization.