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A grinding/polishing tool to aid thin section preparation of small samples[1]

MICHAEL T. NANEY

Chemistry Division, Oak Ridge National Laboratory
Oak Ridge, Tennessee 37830

Abstract

A simple two piece grinding/polishing tool permits controlled thinning of samples mounted on round petrographic glass slides. The tool consists of a body with a finely-threaded axial hole and an adjusting screw to control sample thickness.

Thin sections or polished sections are often necessary for optical and electron microprobe analysis of reaction products from high temperature experiments. Special techniques and care are required during the preparation of these samples in order to obtain satisfactory results and to avoid damaging samples that may require weeks or even months to reproduce. This note describes a simple tool and procedure to aid preparation of thin sections that are also suitable for microprobe analysis.

Individual or multiple samples are first cleaned and cast under vacuum in epoxy to form a bubble-free round wafer ~2.4 cm in diameter by ~0.3 cm thick. The epoxy/sample wafer is ground to expose the samples and is then cleaned and the ground side cemented to a 2.54 cm (1 inch) diameter glass slide with the same type of epoxy used for casting. After curing, the excess wafer thickness is removed by grinding or by using a thin-bladed diamond saw.

The tool shown in Figure 1 is a grinding/polishing jig which allows control of the volume of material removed. The tool consists of two parts, (a) a body with a finely-threaded axial hole and counterbore and (b), a sample adjusting screw providing a moveable base to allow progressive exposure of a small volume of material. This principal was used by Blackburn and Dennen (1969) to design a grinding tool for thinning standard petrographic sections. The tool described here is of simple design lacking the micrometer head in the Blackburn and Dennen device; hence it is easier and less expensive to construct. A crude micrometer for monitoring relative changes in sample thickness can be added to the tool. Radial lines 10° apart, scribed on to the face of the threaded end of the body can be used in conjunction with an index (e.g., screwdriver slot) on the sample adjusting screw to indicate sample thickness changes of approximately 24 microns.

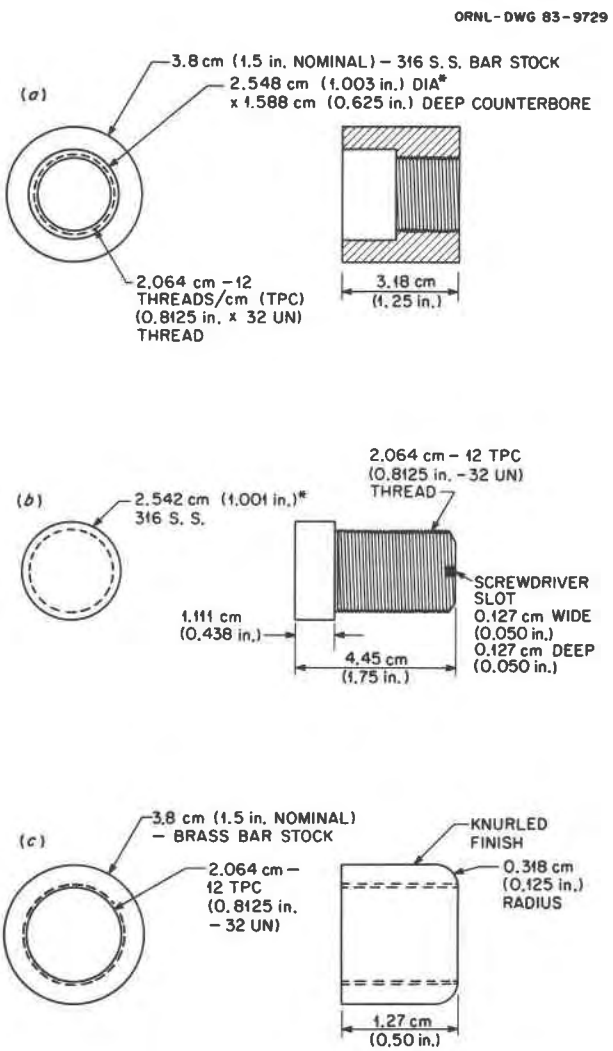

Fig. 1. (a) Body of grinding/polishing tool. (b) Sample adjusting screw. (c) Lock nut. These dimensions shown with an asterisk must be adjusted to accommodate the users supply of glass slides, since the diameter of these slides varies from lot to lot and within lots.

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The grinding/polishing tool is fabricated from sufficiently hard corrosion-resistant 316 stainless steel bar stock. After extended use, the grinding face of the body becomes worn and the counterbore can be re-machined to the original depth. In the process of grinding, a sharp edge is created on the body of the tool and should be smoothed periodically with abrasive cloth. The locking nut shown in Figure 1c, provides a positive method of securing the position of the sample adjusting screw.

The round glass slide of the sample mount can be attached to the head of the sample adjusting screw by use of round pieces of double coated adhesive tape. Grinding is done on dampened wet-dry abrasive paper backed by a thick glass plate to assure a flat cutting surface. As the desired specimen thickness is approached, finer grained abrasive paper should be used and frequent visual or petrographic inspections of the sample should be made. After grinding to the desired thickness the same tool can be used for lap polishing following standard procedures (Hutchinson, 1974).

The most important advantages to be gained from the use of the grinding/polishing tool are: (1) the ground surface remains parallel to the surface of the glass slide, thus preventing loss of portions of the thin section due to differential applied pressure during grinding. (2) The amount of material removed by grinding can be precisely controlled, allowing sections to be ground thinner or thicker than normal.

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