

NOTES ON FINAL GRINDING OF PETROGRAPHIC THIN SECTIONS

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INTRODUCTION

The final hand grinding of petrographic thin sections presents many difficulties and frequently many slides are ruined before the necessary technique is developed. The writer, after many unsuccessful attempts to consistently produce good slides, has noted two possible causes of failure: (1) insufficient observation of the progress of the grinding, and (2) curvature of the glass grinding plates. Although the remedial methods given here may be in use, the writer is not aware of mention of them in the literature.

Basically, the two remedies consist of (1) illuminating the glass grinding plate from below, and (2) producing the desired surface on the glass plate by hand grinding.

ILLUMINATION OF THE GLASS GRINDING PLATE FROM BELOW

The reason for illuminating the glass grinding plate from below is the prevention of (1) wedging or beveling of the section, and (2) loss of parts of the section.

It is essential that profound wedging or beveling of the section be eliminated. Illumination from below reveals this wedging or beveling at an early stage, frequently before it could be observed otherwise. With dark rocks, the color of the section can be used to detect wedging, but with very light rocks a difference of 0.01 mm. is scarcely visible, by either reflected or transmitted light.

It is important to detect when loss of parts of the section occurs through wedging or breaking loose. The later is particularly important in soft rocks where crushing of the loose fragments cannot be felt through the fingertips.

With the larger sections the points of maximum grinding can also be seen by noting the thickness of the abrasive film under the section itself. Where the film is thinnest, grinding is most rapid, as can also be observed by watching the disappearance of a few pencil lines drawn across the ground rock surface, as grinding proceeds.

Although ground surfaces on the corners of the glass slide do no harm, they are not to be desired and furthermore indicate considerable tipping of the slide during grinding. A touching corner is quite apparent when illumination is from below.

To obtain illumination from below, the glass plate may be mounted as a top of a well in a table or as a part of the top of a box. In either case

the plate should be mounted with its surface slightly higher than the surrounding wood and should fit snugly.

Adequate ventilation must be provided for as heat will cause rapid evaporation of the water from the mud on the plate. The choice of the correct amount of light will be determined by the dimensions of the box, and preliminary diffusion of the light is not particularly essential in that the ground glass surfaces of the plate itself accomplish this. If desired, however, an old grinding plate may be mounted inside, directly above the light, to aid in diffusion of the light, and to prevent excess heating of the upper plate.

A switch should be mounted on the outside as there are a few light gray slides in which loss of material can be seen best by illumination from above rather than below.

A large notch should be cut in the frame to facilitate removal of plates. It is best to establish some standard size for the plates and build the frame to fit, in order to aid in the replacement of plates.

LEVELING OF CURVED PLATES

Thick centers seem to be characteristic of slides cut by beginners. The causes of thicker centers than edges in slides are: (1) convex curvature of both surfaces of the section due to grinding on a curved plate, and (2) the natural tendency to tilt the slide and hence grind more on the edges than in the middle. Care will eliminate the later, but only a flat plate will eliminate the former.

A concave curvature of the surface of the grinding plate will usually result in a convex curvature of the section ground on that surface. The glass plates are usually curved slightly when bought, and become decidedly concave after moderate use. Although having the center of a plate 20 cm. wide 1 mm. lower than the edges may seem insignificant, it will make the surface ground on it convex to the extent of 0.01 mm. in a section 20 mm. wide. This causes quartz to be yellow in the center of the slide and white on the edges, greatly diminishing the value of the slide for study. This effect will be partially nullified by bending of the slide in grinding if the pressure is applied only to the center of the slide, but this does not remedy the basic cause.

There are two ways to detect curvature of a grinding plate. A good straight edge laid across the plate will reveal major curves, but lesser curves are not readily detected in this manner. A better method for the later is to observe the distortion of the reflection from the clean dry plate when it is held almost parallel with the line of sight. Looking thus at the reflection of the crossbars of a window is a particularly sensitive test.

In order to correct curvature, the plate should be fastened securely and rubbed with a carborundum stone or block of metal fed with abrasive. Grinding is rapid, and should be confined largely to the edges of the plate. When the surface is plane, fine abrasive should be used until smooth, for a rough surface will make section grinding too harsh and rapid.

Care should be taken to avoid making the plate convex, which will cause the centers of large slides to be ground away before the edges are "down."

A little time spent in regularly leveling the plates will increase the percentage of good slides considerably. Repeated replacement of worn plates with new glass is not very satisfactory because the "breaking in" of the new plates takes time and some glass is curved when bought.