

POLISHING THIN-SECTIONS

The following technique refers to polishing standard 22 x 44 mm petrographic thin-sections.

Equipment Needed

There are three laps in the rock room on the 1st floor of Stevenson Center (Math bldg rm 1110.) These are to be used only for polishing thin-sections. Do not use them to polish anything else. Do not use this set up to polish ring form mounts. The initial polishing compound that I use for polishing thin-sections produces a slight chemical reaction when it comes in contact with both thin-section epoxy and Epoxide. The reaction produces a "wrinkled" surface on the ring form mounts. This is not a problem with thin-sections because so little of the exposed surface area of a thin-section is epoxy. With mineral grains mounted in ring forms this presents a cosmetic problem.

- 1) The lap on the left as you face the wall is for rough, or initial, polishing. The initial polishing lap uses a Buehler perforated Texmet lap, and Spectrum 8-12 μ diamond lapping compound. The perforated Texmet lap does not come with adhesive. You must use hairspray, photomount, or some other spray type of adhesive. I keep a can of spray adhesive in the polishing supplies box.
- 2) The lap in the middle is for intermediate polishing. It uses 1/4 μ Buehler Metadi diamond paste on a Buehler non-perforated Texmet lap. This lap comes with self-stick adhesive.
- 3) The final polishing is done using Buehler 0.06 μ colloidal silica on a Buehler Mastertex lap. This lap also comes with a self-stick adhesive. This is the lap on the left.

To Prepare Thin-Sections For Polishing:

A good polish on a thin-section can be obtained only if the thin-section was made correctly in the first place.

Try to make your thin-sections as evenly as possible. I suggest the following tips which are to be used with standard thin-section making techniques.

- 1) Grind the thin-section using the grinding wheel on the thin-section machine until the quartz is yellow-orange (upper first order). I rotate the thin-section every three or four swipes to insure an even thickness. Examine the thin-section carefully with a petrographic microscope. The thin-section viewer in the optical room often makes a thin-section look more even than it actually is. Note where the thick or thin areas are on the thin-section.

- 2) Hand grind the thin-section using #600 grinding powder and the glass plate designated for #600 grinding. Press down with your pinky finger over the thick areas and don't press at all over the thin areas, while grinding the

thin-section using a figure eight pattern. I have found that this works well. After I even out the thickness of a thin section, I lightly grind the whole thin-section with the #600 grinding powder. This is the Voodoo step. I have found that this final grinding step makes a difference in the quality of the polish. Without doing this final grinding I have found that the polished surface is uneven.

To Polish Thin-Sections

- 1) **Initial polishing:** The initial polishing step uses 8-12u diamonds which are suspended in a blue oil-based compound.
 - A) Place a 1-2 cm long squirt of the 8-12u paste onto the lap.
 - B) Mix a few drops of machine oil into the diamond paste. Smear the mix over most of the area of the lap.
 - C) Wet the routed side of the thin-section holder with distilled H₂O.
 - D) Place the thin-section into the recessed area of the holder. The surface tension will hold the thin-section in place.
 - E) Turn the lap on the low speed and rotate the thin-section in the direction opposite the turning direction of the wheel.
 - F) Push down hard enough to hear a light grinding noise. Don't press too hard or you may crack the thin-section.
 - G) You must also exert a slight force to hold the thin-section holder together. If this is not done, sometimes the thin-section flies out of the holder and cracks.
 - H) Polish for 2-3 minutes. The thin-section should look slightly polished after this step. More importantly, however, the thin-section should look evenly polished. If not, you should consider evening out the thin-section with the #600 grinding powder. If the thin-section doesn't look evenly polished at this step, it will not be evenly polished after the final step.
 - I) You should be able to polish 5-6 thin-sections with this amount of diamond paste and oil. If you feel that the thin-section is getting hot you should add a few drops of the machine oil to lubricate the lap.
 - J) Completely clean the thin-section and holder. Leave no trace of the blue diamond paste on either the thin-section or the thin-section holder.

- 2) **Intermediate polishing:** The intermediate polishing step is done using 1/4u diamonds which are suspended in a gray oil based compound. I sometime skip this step of the polishing, i.e., I go from the 8-12u directly to the colloidal silica. It all depends on the sample that I am polishing. Until you become experienced in polishing I suggest doing the intermediate step.

- A) Place a 1-2 cm long squirt of the 1/4u paste onto the lap. Mix a few ml's of ethanol with the paste. This helps to suspend the diamonds.
- B) Smear this over the center of the lap.
- C) Wet the routed side of the thin-section holder with distilled H₂O.
- D) Place the thin-section into the recessed area of the thin-section holder. The surface tension will hold the thin-section in place.
- E) Turn the lap on the low speed and rotate the thin-section in the direction opposite the turning direction of the wheel.
- F) Push down hard enough to hear a light grinding noise. The grinding noise is softer than the noise from the initial polishing step.
- G) Don't press too hard or you may crack the thin-section.
- H) You must also exert a slight force to hold the thin-section holder together. Sometimes if this is not done the thin-section flies out of the holder and cracks.
- I) Polish for 2-3 minutes.
- J) You should be able to polish 5-6 thin-sections with this amount of diamond paste and ethanol.
- K) If you feel that lap is drying out you should add a few drops of ethanol or distilled H₂O. Completely clean the thin-section and the holder. Leave no trace of the gray diamond paste on either the thin-section or the thin-section holder.

3) **Final polishing:** The final polishing step is done using 0.06u colloidal silica which is suspended in a high pH (~9) aqueous base.

- A) Place one capful of the colloidal silica on the lap.
- B) Mix this with 4-5 ml's of distilled H₂O.
- C) Wet the routed side of the thin-section holder with distilled H₂O.
- D) Place the thin-section into the recessed area of the holder. The surface tension will hold the thin-section in place.
- E) Turn the tap water on. The valve is under the counter below the initial polishing lap. The water must be turned on and off each time you use the polishing set up.
- F) Turn the lap on the low speed and rotate the thin-section in the direction opposite the turning direction of the wheel. In this step you will hear no grinding noise.
- G) Push down about as hard as you did in the two previous steps.
- (H) Don't press too hard or you may crack the thin-section.