

**University of Saskatchewan  
Department of Mechanical Engineering  
Standard Operating Procedure # Mat0025**

**Procedure Title: Alcohol Based Diamond Suspensions for Polishing Water Sensitive Materials**

**Minimum Review Requirements:    Annually**

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**1. Version History**

Version #:           .1          

Supersedes:           n/a          

Handwritten amendments to the official procedures can be made by a single line through the text, along with the date, and initialed by the authorized individual making the correction. Changes are to be noted below. Formal changes to this SOP are made on the date of revision or sooner, where required.

Section	Changes made to official copy	Date	Initials

Reference Only

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**2. Introduction**

This SOP provides general usage guidelines for polishing water sensitive specimens, such as magnesium, using alcohol based diamond suspensions. Alcohol based suspensions must be treated as hazardous waste, and must not be allowed to drain into a sink or floor drain.

As different etchants have different toxicities and properties this document does not attempt to identify specific hazards, for such information the MSDS of the chemicals being used should be consulted.

For all laboratory procedures, including this SOP Mat0001 and Mat0002 must be followed. These SOPs detail waste collection, labeling and disposal.

**3. Definition**

- SOP: Standard Operating Procedure
- MSDS: Material Safety Data Sheet
- WHMIS: Workplace Hazardous Materials Information System
- PPE: Personal Protective Equipment
- WSEP: Workplace Safety and Environmental Protection

**4. Personnel**

Persons authorized to perform this SOP:

By signing this form I acknowledge that I have read and understand this SOP, as well as the applicable MSDS's and that I will conduct myself in accordance with this SOP and the general laboratory rules.

**NOTE: ALL SIGNATURES MUST BE PRESENT ON THE SOP LOCATED IN THE YELLOW BINDER IN ROOM 2C26 – Mechanical Engineering Materials Lab**, digital copies of SOP's are made available for reference and convenience only. Printed SOP's are valid for 24 hours only, after that time their accuracy must be verified with the **OFFICIAL HARDCOPY VERSION**.

Name (Print)	NSID	Dep't	Signature	Date

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Name (Print)	NSID	Dep't	Signature	Date

Only

**5. Safety**

During polishing with alcohol based suspensions the following should be avoided:

1. Contact with the skin and eyes
2. Inhalation
3. Ingestion
4. Contamination of work area – poses a health risk to others.
5. Some chemicals are not compatible with some materials (we typically use Nitrile gloves; however for some chemicals a different glove type **MUST** be used).
6. Glove compatibility charts are available from glove manufacturers and **MUST** be consulted prior to chemical usage.
7. See the relevant MSDS or PDS for the toxicological properties of the chemicals being used.
8. Labcoat, Safety glasses with splash shields or goggles and appropriate gloves are required.

**6. Procedure**

For a detailed procedure on polishing see Mat0003 – Grinding and Polishing Metallic Samples. The general procedure used in Mat0003 should be used with the following exceptions:

1. All waste including rinse water must be collected in an appropriately labeled waste container – see Mat0001 and Mat0002.
2. The desktop polisher in OC14 should be used so that the waste suspensions and lubricants can be collected via the drainage hose. DO

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NOT use the in bench units in 2C26. The waste container must be sealed when not in use and the polisher must be flushed daily after use.

3. It is preferable to have the polisher in a fume hood during use.
4. The suspensions are classed as flammable and must be stored accordingly.
5. Separate polishing cloths/discs are required for this procedure to avoid contamination of non-alcohol based polishing procedures.

**General Procedural Steps:**

1. Fine grinding on 1200 grit (FEPA) Si-C paper using 100% ethanol as the lubricant.
2. Rinse twice with an alcohol squirt bottle into a waste container (a funnel is recommended).
3. Fine grinding on 2400 grit (FEPA) Si-C paper using 100% ethanol as the lubricant.
4. Rinse twice with an alcohol squirt bottle into a waste container (a funnel is recommended).
5. Fine grinding on MD-Largo disc with DP-Suspension A 9 $\mu$ m using DP-Brown as lubricant.
6. Rinse twice with an alcohol squirt bottle into a waste container (a funnel is recommended).
7. Coarse polishing on MD-Mol disc with DP-Suspension A 3 $\mu$ m using DP-Yellow as lubricant.
8. Rinse twice with an alcohol squirt bottle into a waste container (a funnel is recommended).
9. Fine Polishing on MD-Nap disc with DP-Suspension A 1 $\mu$ m using DP-Yellow as lubricant.
10. Rinse twice with an alcohol squirt bottle into a waste container (a funnel is recommended).
11. Final Polishing on MD-Nap with a mixture of 80 ml 100% ethanol, 20 ml ethylene glycol and 3 teaspoons of alumina powder (0.05  $\mu$ m).
12. Rinse twice with an alcohol squirt bottle into a waste container (a funnel is recommended).
13. Use running tap water to fully flush the drainage hose and basin of the polisher into an appropriately labeled waste container, the label should be 99% water, with trace amounts of whatever polishing suspensions and lubricants were used.
14. Seal the waste disposal container(s) and place in the secondary containment.
15. Arrange for waste disposal pick up as per Mat0001.

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## **7. Equipment or Materials Required**

The following Personal Protective Equipment (PPE) is required for this procedure:

- Nitrile Gloves
- This SOP
- Mat0003
- Lab Coat
- Closed Toed Shoes
- Safety Glasses
- Long Pants
- MSDS and PDS Information
- Operational Eye Wash Station
- Polishing wheels
- Various SiC grinding discs and polishing cloths
- Various diamond suspensions
- **NOTE: NONE OF THE GLOVES USED IN THE LABORATORY ARE INTENDED FOR SUBMERSION USE, THEY ARE FOR SPLASH/SPILL PROTECTION ONLY.**

## **8. Highlights/Critical Control Points**

1. Alcohol based suspensions must be treated as hazardous waste and proper waste collection, disposal and handling procedures need to be followed.
2. Proper rinsing between steps will ensure that cloths do not become contaminated with a larger abrasive; once a cloth is contaminated it is ruined.

## **9. Regulator/Standards**

All Waste disposal standards must be followed along with Mat0001 and Mat0002.

## **10. References**

Allied High Tech: Polishing - Diamond Compounds / Suspensions:  
[www.alliedhightech.com/polishing/diapolishing/](http://www.alliedhightech.com/polishing/diapolishing/)

Material Safety Data Sheet:  
[mfc.engr.arizona.edu/safety/MSDS](http://mfc.engr.arizona.edu/safety/MSDS)

Mechanical Engineering Safety Page (U of S):  
<http://www.engr.usask.ca/safety-me/materials.html>

Safety data sheet - ATM GmbH:  
[www.atm-m.com/](http://www.atm-m.com/)