

The Tools of the Trade

A short list of tools used in crystallographic and X-ray diffraction experiments.

1. Picks/probes

a. Micro tools¹



b. 0.7 pencil/ sewing needles²



c. Beading Needles³



d. Micro pick⁴



e. Acupuncture needle⁵



f. Micro Probes⁶



g. Micro needles/ micro-Pin vice⁷



2. Inoculation Loops⁸



3. Paintbrush⁹

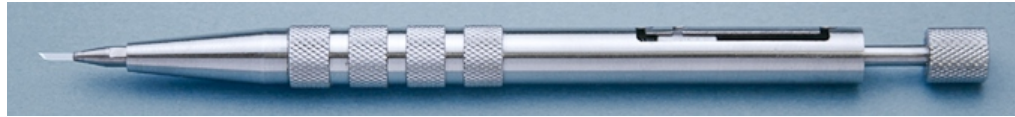


4. Knives

- a. X-acto
- ¹⁰



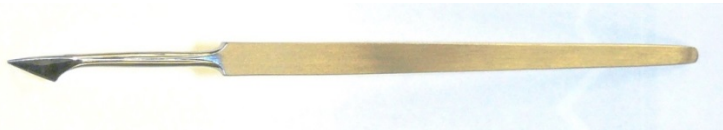
- b. Sapphire
- ¹¹



- c. Scalpel
- ¹²



- d. Dissecting Needle
- ¹³



5. Spatulas

- a. Micro-spatula
- ¹⁴



- b. NMR tube spatula
- ¹⁵



- c. Sculpture tools
- ¹⁶



6. Pins/Loops

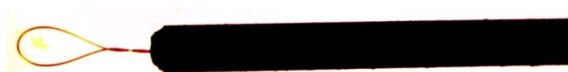
- a. Brass/Copper
- ¹⁷



- b. Brass specimen pins
- ¹⁸



- c. Nylon loop
- ¹⁹



d. Kapton loop²⁰



e. Magnetic Bases²¹



7. Fibers/capillaries

a. Glass

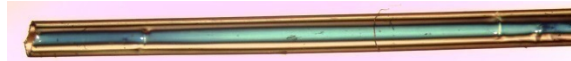
i. Fiber²²



ii. Capillary²³



b. PET²⁴



c. Kapton²⁵



d. Jobber Drill #68 for 0.8-1.0mm, #78 for 0.5-0.8mm (pack powder in kapton/pet)²⁶



8. Glue

a. Nail Polish²⁷



b. Super Glue Gel²⁸



c. Duco Cement²⁹



d. Epoxy³⁰

9. Oils and Grease

a. STP oil treatment³¹b. Mineral Oil³²c. Fluorolube³³d. Apiezon M grease (Si free)³⁴e. Petroelum Jelly³⁵

f. Fomblin³⁶

10. Mounting supplies

a. Plasticine³⁷b. Bee's Wax³⁸

c. Glass torches and sealers

i. Micro-torch³⁹ii. Thread Burner⁴⁰

- d. scotch tape⁴¹
i. majic tape

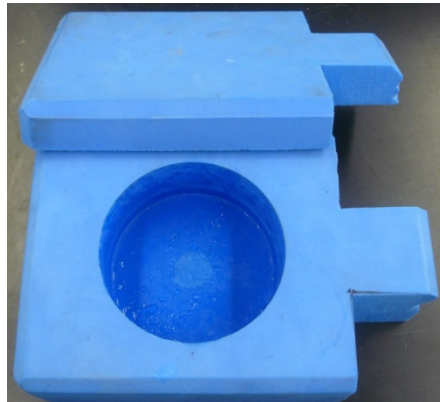


- ii. double sided



11. Dewars

- a. Yoga Block⁴²



- b. Short Dewar Flask⁴³



12. Slides/Spot plates/dishes

- a. Slides with cavities (wells)⁴⁴



- b. Spot plates⁴⁵



- c. Square Petri Dishes⁴⁶



- d. Slide preparation

- i. Rain-X⁴⁷

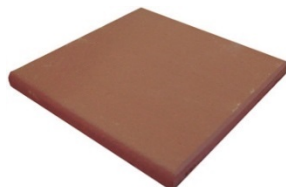


- ii. Teflon Spray⁴⁸



- e. Crystal Drying Tiles

- i. Unglazed ceramic tiles⁴⁹



13. Powder Sample holders and Sieves

a. ZBH⁵⁰b. Quartz Discs⁵¹c. 100 mesh (150 μ) sieve⁵²d. Small Paint Brush⁵³

14. Misc.

a. Floss Picks⁵⁴b. Micro Alligator Clips⁵⁵c. SEM pin stub⁵⁶d. #6 Roofing nails⁵⁷



e. Ruby Spheres⁵⁸



f. Radiaton Monitor (pancake type)⁵⁹



15. Tool Box : Compartment Storage Organizer Box with Removable Dividers⁶⁰



References

- ¹ tedpella.com : keyword : Micro tool, buy only the handle and fine needle
- ² 0.7 Mechanical Pencil and fine sewing needle. Remove lead and insert fine sewing needle at the end of the pencil.
- ³ Amazon keyword : Long Beading Needle Various sizes : 10 to 25 (10 thin to thick) Buy a variety of sizes.
- ⁴ tedpella.com keyword : Micro Pick : Caution : Paint on handle will dissolve in acetone etc..
- ⁵ Amazon keyword : Acupuncture needle. Can be inserted in the pin vice
- ⁶ tedpella.com keyword : Micro Probe
- ⁷ tedpella.com keyword : Micro vice : insert fine sewing needle.
- ⁸ Amazon keyword : inoculation loop. Good for removing crystals from NMR tubes. To use dip loop in oil, insert into tube, spin loop to gather crystals then remove loop.
- ⁹ Amazon keyword : micro paint brush. Good for picking up small dry crystals.
- ¹⁰ Amazon keyword : Xacto knife
- ¹¹ www.wpiinc.com : Very sharp knife good for cutting crystals (warning the knife blade is brittle).
- ¹² tedpella.com : keyword : Dissection knife
- ¹³ www.thomassci.com : Stainless Steel Dissecting Needle with Spear Shaped Head. Use sharpening stone to sharpen spear head to make usable cutting instrument.
- ¹⁴ www.thomassci.com keyword: Micro-spatula. Good for removing air sensitive crystals (in solvent) from vials. Dip spatula in oil, insert into vial, scoop crystals into the oil and then remove.
- ¹⁵ www.wilmad-labglass.com : Wilmad-LabGlass: SST Microspatula, 250 x 3 mm for 5 mm NMR Sample Tube
- ¹⁶ Amazon Keyword: Sculpture tools : Can be used as spatulas
- ¹⁷ www.mcmaster.com. Brass Rod : brass pins: Use plasticine to anchor glass pin and nail polish as adhesive. Choose colored nail polish for identification purposes
- ¹⁸ hamptonresearch.com keyword : Brass Specimen Pin
- ¹⁹ hamptonresearch.com. : keyword : 18 mm Mounted CryoLoop™ - 20 micron : Normal : 0.4 - 0.5 mm size
- ²⁰ www.mitegen.com : keyword : 200 μm aperture DT MicroLoops LD (Normal)
- ²¹ hamptonresearch.com. keyword : CrystalCap
www.mitegen.com keyword : Standard Goniometer Base (B1)
- ²² Micro-torch used to pull glass rods to thin fibers.
- ²³ hamptonresearch.com.: Micro-torch used to seal capillaries. Use wet chem wipe to isolate crystal/powder and then heat and pull.
- ²⁴ www.ventionmedical.com/products-and-services/advanced-polymers/heat-shrink-tubing : Choose thin-walled tubes 0.5-0.25mm
- ²⁵ Amazon keyword : thin walled kapton tubing : Miniature Polyimide Tubing or www.coleparmer.com/p/mn/6806
- ²⁶ McMaster Carr : <https://www.mcmaster.com/#jobbers-drills/=1bhd5t9>
- ²⁷ Amazon keyword: Nail Polish. Adhesive which can be removed with acetone. Choose colored nail polish for identification purposes
- ²⁸ www.harborfreight.com : Good adhesive for permanent holds
- ²⁹ Amazon keyword: Duco Glue Good adhesive for non-permanent holds.
- ³⁰ McMaster Carr : 5 min Epoxy
- ³¹ Local auto parts store STP oil. Good cryo-protectant (does have a minor amount of anti-knock Zn additive)
Comment : Buy STP brand name!
- ³² Local Drug Store : Low viscus oil.
- ³³ www.fishersci.com : comment Use flurolube oil when STP is not suitable.
- ³⁴ www.fishersci.com : comment Silicon Free grease high freezing point
- ³⁵ Local Drug Store : Petroleum Jelly, use as a crystal protectant
- ³⁶ Sigma-Aldrich : perfluoropolyether vacuum oil
- ³⁷ Local arts and crafts store For mounting samples, pins, plates and positioning holders.
- ³⁸ Amazon keyword : Bee's Wax comment: For mounting samples, pins, plates and positioning holders
- ³⁹ McMaster Carr : keyword micro-torch
- ⁴⁰ Amazon Keyword: MAX WAX comment : Seal glass capillaries in dry box.
- ⁴¹ Office supply store comment : Use tape to mount samples for transition or reflection X-ray scattering
- ⁴² Amazon Keyword: Yoga Cube : Good for LN2 or Dry ice. Cut a well in the cube to hold LN2, cover with a lid cut from the block. Short blocks can replace the glass dewar to mount crystals with the microscope.

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- ⁴³ www.fishersci.com: Short dewer can be used in mounting crystals with the microscope.
- ⁴⁴ Amazon Keyword : slides with cavities : comment : Good for holding samples covered by solvent.
- ⁴⁵ Amazon Keyword : Spot plate : comment : Good for growing crystals
- ⁴⁶ tedpella.com : keywords : Plastic Square Petri Dishes : good for holding slides (with crystals in oil). Can be compactly stacked with other square dishes.
- ⁴⁷ Auto Parts Store Rain-X, wipe microscope slides for aquaphobic surface.
- ⁴⁸ Local Hardware store : Spray on glass slides for aquaphobic surface.
- ⁴⁹ Home Depot : Use underside of tile. Pipette crystals in their mother liquor onto the tile. The ceramic surface will absorb the liquor leaving the crystals to dry. For temperature sensitive crystals : place the tile in the freezer for one hour. Place the temp sensitive crystal on the tile in the freezer and allow to equilibrate. Remove the tile/crystals and move to microscope for crystal selection. The plate will take about 3 mins to warm to room temp so act quickly.
- ⁵⁰ www.mtixtl.com keyword : Zero-Si-24D10C1 Zero background. Mount in stainless Steel holder.
- ⁵¹ McMaster Carr : Quartz disks are cheap powder sample holders. Sand blast surface to create a shallow divot.
- ⁵² Hogentogler : <https://www.hogentogler.com/sieves-shakers/>. Use to sieve powder for size. You can position a sieve over the ZBH, load a powder and gently tap, to produce a monolayer of dispersed powder on the ZBH surface.
- ⁵³ Use to “sweep” powder through sieve.
- ⁵⁴ Drug Store : good for mounting fibers or thin films. Remove floss, tape sample to holder and Insert tip in goniometer head.
- ⁵⁵ Amazon keyword : Micro Alligator Clip Good for holding odd shape samples in the X-ray beam during scattering experiments. Flatten end piece of clip and insert into goniometer head.
- ⁵⁶ tedpella.com : keyword : SEM pin mount use for mount samples for powder diffraction on SCD instrument
- ⁵⁷ Local hardware store : 2.5 cm to 4cm length (1 to 1.5 inch) Copper or Stainless Steel. use for mounting samples for powder diffraction on SCD instrument
- ⁵⁸ www.alfa.com/en/ruby-spheres/ : Use as alignment crystals. Not all spheres are single un-twinned crystals. Buy several and examine them one by one to find a single crystal.
- ⁵⁹ Technical Associates TBM-15 : <http://www.tech-associates.com/product-info/tbm-15.html>
- ⁶⁰ Local Crafts store. Compartment Storage Organizer Box with Removable Dividers