

Tips for Using MicroMounts™

MicroMounts™ are used in much the same way as nylon loop mounts, although there are some important differences. The nonmagnetic stainless steel pins are compatible with existing bases and mounting hardware. Our suggested procedures follow. If you find better or novel ways to use them, please tell us!

- Select a mount with a sample aperture size **slightly smaller** than the crystal size. Unlike with loops, *you don't want to trap the crystal inside a liquid meniscus spanning the aperture*. You want to have it resting on the edges of the aperture, to minimize excess liquid and background X-ray scatter.
- Cut the pin (if necessary) to a desired length using our pin cutters or other cutters designed for spring-temper steel. The center-to-center distance between black lines on the pin is 2 mm. Use the millimeter scale on the top of the box to help cut it to the desired length, lining up the end of the pin with the right end of the scale.
- Insert the pin into a standard goniometer base using a small amount of, e.g., Dow-Corning #976V high vacuum grease or Duco Cement to hold it in place. For easier handling, attach the base to a magnetic rod. The pin can also be inserted into a 0.7 mm mechanical pencil.
- Slowly and carefully insert the gold-colored tip into the crystal-containing drop, trying to minimize fluid motion. Slide the sample aperture under your crystal, and then carefully remove the crystal + mount from the drop, keeping the crystal centered over the sample aperture.
- To retrieve crystals that have settled to the bottom of a crystallization plate, try pressing downward to bend the tip of the mount so that it slides flat along the bottom.
- If there is excess liquid, slowly and carefully insert a size 15 paper wick into the large opening that connects to the sample hole. If you have lots of liquid and you insert the wick too quickly, the crystal will flow with the liquid to the wick. For viscous liquids you may need to "mop up" around the crystal with the wick.
- You should find that it is no longer necessary to use Paratone or other heavy oils to replace surrounding liquid that otherwise would form hexagonal ice rings. Mounted correctly, **you should have very little liquid around your crystal** - far less than when using nylon loops. The flash cooling rate will be much faster than in a loop and the cryoprotectant concentrations required to prevent icing much smaller. Your penetrating cryoprotectant concentration should often be sufficient to prevent crystallization of external liquid.
- In general, it's bad to have a lot of any liquid - water or oil - around your crystal during flash cooling: when the liquid freezes, it will tend to crush your crystal. If you have just a thin layer of liquid around the crystal, it will shatter (like the shell of an egg) and so do little damage.
- Flash cool the crystal by your favorite method. We recommend plunge cooling in liquid nitrogen, in liquid nitrogen that has been vacuum-pumped to near its freezing temperature (to reduce boiling), or (somewhat better but much more dangerous) in liquid propane.

Tips for Mounting Very Small Crystals

When working with very small crystals (well below 100 microns), **dehydration is your worst enemy** and time is of the essence. We recommend working in a humidified environment (E.g., stretch plastic on a frame over your work area and either run a steam vaporizer inside), or in a cold room (where evaporation rates are roughly 1/4 those at room temperature.) **Don't encase your crystal in a blob of liquid!** Your crystal will be more likely to suffer cryodamage, and your background scatter will be much worse.

Some users have complained that the mounts seem to push small crystals away, as if they were too hydrophobic. That's **not** what's going on. What you see is a simple demonstration of laminar flow and Stoke's Law. When you move the mount through a crystal-containing drop, the liquid flows lamina-ly around it. If the crystal's density matched that of the liquid, it, too, would just flow around the mount, and it would be nearly impossible to snag it.

If the crystal's density is larger than that of the liquid, the crystal will sediment under the influence of gravity toward the mount. The crystal's sedimentation speed is determined by the balance between the gravitational force pulling down and the viscous drag force given by Stoke's law that opposes motion. It's an easy matter to show that this sedimentation speed varies as the square of the crystal diameter. Thus, the time for the crystal to sediment onto the mount increases rapidly as the crystal gets smaller. You then need to move the mount very slowly (or keep it still) to allow enough time for the crystal to sediment through the liquid around the mount and onto its surface. For the smallest crystals, you should probably hold the mount with a simple micromanipulator unless you have very steady hands. Things aren't quite as bad as all this because some liquid can flow through the crystal and wicking apertures, but the basic principles still apply.

For very small crystals you might want to consider using our MicroMesh™ mounts, which are easier to use but produce somewhat more background scatter.

Tips for Cleaning MicroMounts and MicroMeshes

Medium (M) and Fine (F) wicks are ideal for cleaning MicroMounts. Cut back from the widest end using a razor blade so that the diameter fits into a mechanical pencil or pin vise. Then dip the other end in water, a detergent solution (e.g., Alconox or PEX) or in isopropanol, and gently stroke the gold-tinted polyimide from base to tip. The key to minimizing risk of damage is to have the width of the wick's tip comparable to or larger than the polyimide width. As the wick's tip loses stiffness from use, cut back with a razor blade. In this way you can use a single wick for several cleanings.

We've also tried cotton and foam-tipped swabs, but they tend to catch and tear the polyimide.

Remember: the polyimide in MicroMounts is not a fiber like nylon, so it has less tensile strength than nylon. It can be torn more easily, and can crack if bumped when cold. Be gentle!

Blow-drying MicroMounts

You can use a compressed air gun or a spray can duster to dry MicroMounts and remove dust. But be careful: **Never hold the tip of the sprayer closer than 2 inches from the mount**, and be sure that the pressure in your compressed gas line is 20 psi or less. Some labs (for example, Mitegen's assembly facility) have compressed gas lines at 100 psi, and a full blast can blow the tops off the mounts. The same thing can happen if you blow a few millimeters away using a canned duster with the extension tube attached.