Removing Dust, Stains and Impurities From Optics

Most optics in the lab have special anti-reflection coatings. These coatings make lens surfaces almost invisible. However, they are delicate and easily scratched. They must be handled with care to preserve the optical component. Never try to touch these surfaces!

Dust and stains on optics can cause scattering, and impurities on the optic surface can react with incident laser light to damage optical coatings. With proper handling and cleaning of your optics, you can prevent damage and ensure their continued performance.

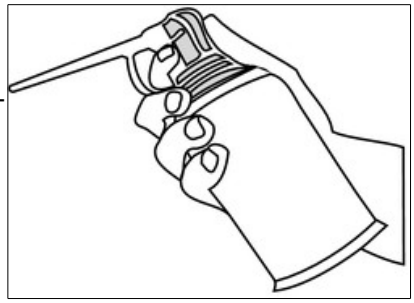
General Tips

If it's not dirty, don't clean it! Handling optics increases their chances of getting dirty or damaged, so you should clean optics only when necessary.

You should handle optics in a clean, low-dust environment while wearing powder-free acetone-impenetrable gloves or finger cots. You can also carefully handle them without gloves if you are very careful not to touch the optical surface. Since oil and debris from your hands or from used Lens Tissue can stain or damage optical coatings, you should not touch any transmissive or reflective surface of your optic and ***never reuse a lens tissue.*** Remember that lens tissues are inexpensive compared to the price of an optic.

Inspect an optic for dust and stains by holding it near a bright visible-light source. Viewing the optic at different angles allows you to see scattering from dust and stains.

Step 1. Use a clean-air duster:



Dusting is always the first step in cleaning your optics. Wiping a dusty optic is like cleaning it with sandpaper. So always dust with a canned air duster, compressed and filtered air, or a "puffer" before wiping any optic. If the dusted optic has no visible stains after you dust it, then remember: "If it's not dirty, don't clean it." If it's still not clean, proper use of solvents and lens tissue can often do the trick.

Step 2. Use solvent and lens tissue:

The way to use a solvent depends on the optic, but always wipe slowly and clean the edges first.

Glass-cleaning solvents, like Windex, will streak, and tissue paper or a t-shirt will scratch, so always clean optics with reagent- or spectrophotometric-grade solvent and a low-lint tissue manufactured for cleaning optics. Always use lens tissue with a solvent, because dry lens tissue can scratch optical surfaces. A good solvent to use is a mix of 60% acetone and 40% methanol. Use the solvent provided by the instructor. Most of the solvents dry very quickly, so you have to work fairly quicky before the solvent evaporates. Slow evaporating solvents can leave drying marks on the optic. Cleaning your optic's edges before cleaning its faces prevents dirt from being drawn up onto the face. Wiping slowly allows the solvent to evaporate without streaking. Remember, slow and steady cleans the optic.

The "Drop and Drag" Technique

The "drop and drag" technique is ideal for light cleaning of unmounted optics, such as our mirrors, polarizers and beamsplitters.

Place your optic on a clean, non-abrasive surface, such as a paper towel covered with a lens tissue. After blowing off the dust using compressed air, lay a piece of unfolded lens tissue over the optic, drop on some solvent so that it wets over the whole surface of the optic, and slowly drag the soaked tissue across the optic's face, and then throw the tissue away.

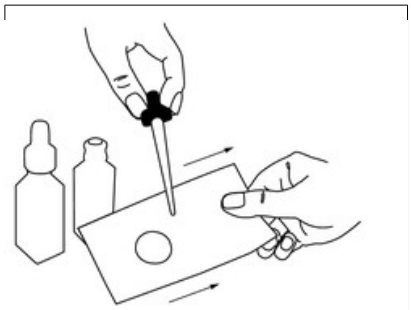


Illustration 1: Slowly drag the wetted tissue across the optic's face

Drop solvent onto your lens paper and drag the soaked tissue slowly across the optic's face. Remember to clean the edges of your optic before you clean the face.

The "Brush" Technique

Use the "brush" technique for tougher stains on small optics.
Make a lens-tissue brush by folding the lens tissue so that the fold is as wide as the optic to be cleaned. Do not touch any part of the tissue that will touch the optic. With a hemostat or tweezers, grip the folded tissue parallel to and near the fold. Wet the "brush" with acetone and shake off any excess liquid. Blow off the dust. Place the brush on the optic surface, apply slight pressure with the hemostat, and slowly wipe straight across, from one edge of the optic surface to another, and then throw the tissue away.

Wipe slowly straight across from one edge of the optic to the other.

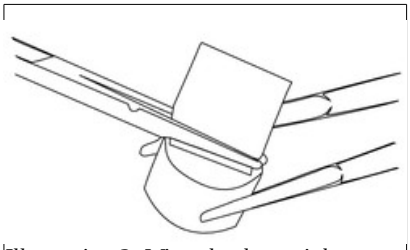


Illustration 2: Wipe slowly straight across from one edge of the optic to the other.

The "Brush" Technique for Small-Diameter or Mounted Optics

You can use a modified "brush" technique for small-diameter or mounted optics. For optics with hard-to-reach edges, make a small brush by wrapping an optic tissue around the soft tip of a synthetic low-lint swab. In one motion, "paint" the optic perimeter and sweep across the center of the optic. Wiping in a continuous motion prevents drying marks.

The "Wipe" Technique

(not recommended for metallic coatings)
This method is useful for heavier cleaning of stubborn stains. You ***must*** use gloves with this technique! Fold the lens tissue as described in the "brush" technique above, and grip it with your fingers instead of the hemostat.

Only use the "wipe" technique to remove stubborn stains on more durable coatings.

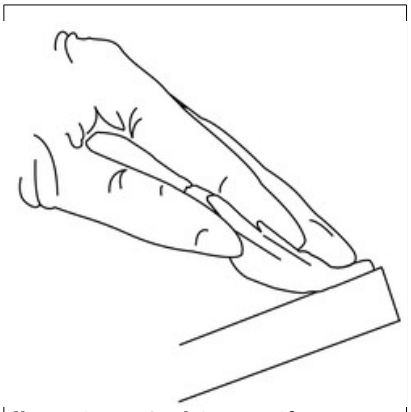


Illustration 3: Applying a uniform pressure on the optic edge, slowly wipe across the optic's face.

The "Immersion" Technique

For softer coatings, which damage more easily, we recommend using the "immersion" technique. Simply remove any dust from the optic and then immerse it in acetone. If the optic is very dirty, you can use an ultrasonic bath. Rinse and immerse the optic in fresh solvent a number of times until it's clean. To dry the optic, carefully blow the solvent off from one direction to avoid leaving drying marks.

Once You Have Cleaned Your Optic

Place the optic in the mount it will be used in or wrap it in lens tissue and place it in its container right away.

Video

https://www.youtube.com/watch?v=9Pq4SeNmFYw