

Understanding the Microscope - part 11. Cleaning Microscope lenses

In order to see if there is significant dirt on a lens, examine the surfaces using reflected room light, or an angle-poise lamp. Dirt and dust stand out on the plane optical surface. An objective, particularly one of medium or higher power (20:1 or 20x and above) which has a concave front lens, should be examined from the screw thread side. Direct the objective at a well-lit plain white surface, such as the wall or ceiling (you do not want structure in an image to obscure any dirt). First try to dislodge dry, loose, dirt with a photographer's hand-bulb blower. Do not use one with a bristle brush; this may scratch the surface. Likewise a compressed-air cylinder may leave dried-on traces of propellant; it is in any case a very forceful method: if used do so with care. More stubborn particles can either be removed with a very soft camel hair brush, or with a piece of moistened lens tissue. Never use Kleenex-type toiletry tissues for cleaning optical surfaces, as these will severely scratch and abrade the lens coatings. It is equivalent to substituting sandpaper for toilet tissues! The lens tissue must be used damp; dry lens tissue can abrade lens surfaces and discard each piece of lens tissue after a single use.

Do not use detergent or soap in any form. Dilute solutions will ease their way between lens doublets leaving a thin interference film; this obviates the purpose of strain-free objectives! If distilled water does not work try a little filtered Analar xylene. Since this is greasy follow it with filtered methylated spirits, kept for the purpose. (This method using purple methylated spirits was taught to me by one of the best Zeiss engineers in the business). Do not use alcohol; again this can seep between lens elements and dissolve the lens doublets. Olympus, however, advocate a mixture of 3 parts ether and 7 parts ethanol to remove oil and clean immersion objectives. However, I find ether too volatile, and prefer to use petrol (petroleum ether). Do not up-end immersion objectives after use. The solute may seep into the barrel of the objective between the lens mounts, a process which is facilitated by the sprung-loaded objective barrels now in common use.

Do not leave the objective on the nosepiece with oil or water remaining on the front surface of the lens. Older formulations of oil (e.g. cedar-wood oil) will harden and prove difficult to remove without scratching the glass. Although the newer oils are non-drying, they will attract atmospheric dust for this reason and the resultant dust-oil mixture makes a very effective micro-abrasive! Wipe the oil off the front lens with a damp lens tissue. Repeat the process twice more (i.e. in triplicate overall) to entirely remove all the oil. An immersion oil film is not entirely removed at the first cleaning.

Immersion oil can be removed from the slide with saliva (not applied immediately after eating!). This is better than water which is not freely miscible with some oils. Mineral or organic solvents may sometimes soak into, dissolve or remove the slide label. The slide may be wiped dry with a Kleenex-type toiletry tissue. Repeat with distilled water or saliva and finish with distilled water. Take care to fold the lens tissue so that the surfaces which are used for cleaning are not handled. To do this, quarter the tissues four times from one piece, handling by the edges, to leave an unfingered surface. Keep the lens tissues clean and covered in an airtight container (an old cleaned tobacco tin is ideal) reserved for this purpose. After cleaning inspect the glass surface by reflected light. If colour is reflected from the surface of the lens this indicates a thin layer interference film of grease or residual solvent (e.g. xylene). It may help to 'huff' gently on the lens surface. As the thin grey-white hazy water layer evaporates it should do so uniformly; uneven slowness to evaporate in a localised fashion is caused by dirt spots not yet cleaned off the surface.

References

- Barron, ALE (1966) *Using the Microscope* Chapman & Hall, London.
Fletcher, JR. (1988) *The Star Test for Microscope Optics* *Microscopy* 36/2: 153 – 159.
Oldfield, RJ. (1994) *Light Microscopy: an illustrated guide* Wolfe Publishing, London. ISBN 0-723-41876-4

See also the articles on Maintenance of the Microscope by MI 'Spike' Walker in Nos. 26 pages 14-16 and 27 pages 18-24 of the *Bulletin of the Quekett Microscopical Club*, for Autumn 1995 and Spring 1996.