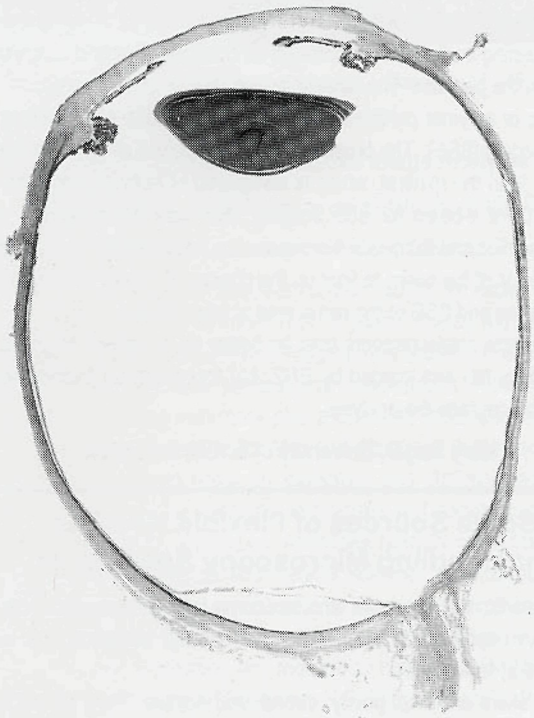

Figure 1. Postmortem eye. Note the nearly perfectly round shaape to the eye, a histologic feature that requires proper fixation, embedding, cutting and tissue expansion. Hematoxylin-eosin.

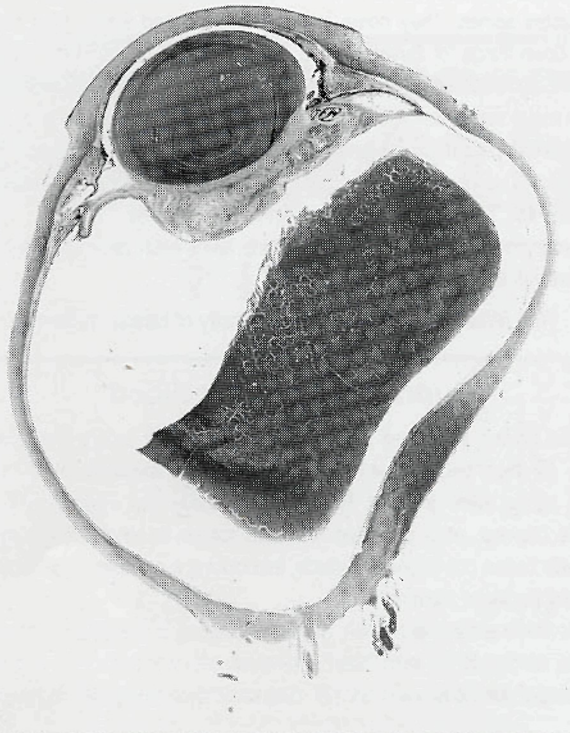

Figure 2. Surgically removed eye. The dark material in the interior of the eye is blood. Despite the presence of a large hemorrhage, the tissue sections are nearly artifact free because of the use of techniques described in this report. The eye is no9t perfectly round because of intraocular pathology. Hematoxylin-eosin.

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Disclamer: The author has no proprietary interest in any product mentioned herein

The Accurate Control of the Thickness of Evaporated Carbon Films

Alwyn Eades, Lehigh University

There are two approaches to determining the thickness of a carbon film evaporated onto a specimen. One approach is to do the evaporation first and to measure the result afterwards. There are several ways to do this. The second approach is to put down a determined amount of carbon in the first place. This clearly has advantages in many cases. The method described here is of this second kind. The thickness of the carbon coating is not measured, but by a predetermined recipe, the amount put on is controlled at the time of evaporation. In principle, the thickness could be measured during the evaporation with a quartz-crystal thickness monitor. However, we find that the monitor we have does not work well with carbon.

Principle

When carbon is deposited onto gold, it forms interference colors that are well defined. They can be used to determine the thickness of the carbon.

The Colors

If carbon is evaporated onto gold, as the thickness of the carbon increases, the color changes through the following sequence: gold, orange, red, blue, grey. The change of color from red to blue is particularly sharp and clear. The change of color from red to blue occurs when the thickness of the carbon is 24.0 nm +/- 0.5 nm. This result was obtained by people at Balzers using a multibeam interference technique for calibration.

Details

1) Take a glass slide (or a strip of aluminum or any other suitable substrate) and evaporate onto it a layer of gold. The thickness is not critical as long as the gold is thick enough to give an opaque film that looks like gold.

2) Mount the slide in the same chamber with the specimen to be coated with carbon. The thickness of the carbon on the slide will be 24 nm, so arrange the distance of the slide and the sample so that (by the inverse square law) the desired thickness on the sample will occur when the thickness on the slide is 24 nm.

3) Evaporate the carbon; stop the evaporation as the color changes from red to blue. If a normal arc is being used for the carbon evaporation, the light from the arc will allow the colors to be seen. It may be helpful to have additional good lighting anyway – try it and see. The bell jar will need to be reasonably clean.

Using the Inverse Square Law.

Let T nm be the desired thickness of carbon film; let d be the distance from the carbon arc to the gold slide; let D be the distance from the carbon arc to the specimen. Then:

$$(d/D)^2 = T/24.$$

As a specific example, suppose that 10 nm of carbon is to be deposited, and the sample sits 200 mm from the carbon arc. Then the gold slide should be:

$$d = 200\sqrt{(10/24)} = 129 \text{ mm from the arc.}$$

Reference: The information for this method was obtained from scientists at Balzers High Vacuum in the mid 1960s.