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Filaments for FEI/Phillips Microscopes AGA086

Abstract:

When installing a new filament we recommend using newly-cleaned (and carefully dried) cathode and anode assemblies.

For optimum gun performance it is important that the filament be centred and set precisely at the correct height with respect to the Wehnelt.

Handling:

Always use clean lint free gloves when handling gun components.

Ensure that there are no dust particles adhering to the Wehnelt assembly and to the anode.

Do not over-tighten the filament locking ring as subsequent removal may be difficult and there is some risk of cracking the base.

Beware of handling a Wehnelt which has recently been operational. They get very hot, and also need to be earthed before touching.

Filament Height:

Set the filament tip height according to the beam current required and following the EM manufacturer's recommendations.

Typical Running Conditions:

When inserting a new filament, adjust the height by rotating the top half of the cathode assembly with respect to the lower section, until, with the Wehnelt viewed edge-on, the filament tip is level with the external surface. There are nine full divisions on the cathode assembly, and each full division has a half-spacing marked: hence the height setting is calibrated to 0.05mm. Set the appropriate filament height by turning back approximately 0.2mm when the 0.5mm diameter Wehnelt aperture is used. Now insert the cathode (and a clean anode) before pumping to achieve the best working gun vacuum attainable. Hopefully this is better than 10^{-5} mbar. Slowly heat the filament over a period of a few minutes and adjust the current to achieve a just saturated filament.

Filament saturation is the term employed to describe the condition where maximum beam current is achieved for the lowest setting of filament current. In the TEM filament saturation can be precisely set by observing the focused image of the filament cross-over pattern. It is the point where the pattern from the actual tip just blends completely with the pattern produced by electrons emitted a short distance from the tip (halo region).

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The resultant beam current should now be checked. If the beam current is low then the filament has been set back too far. Conversely, a high beam current indicates that the filament is too close to the Wehnelt aperture.

In TEM applications, some faint residual structure in the filament cross-over image is acceptable - users report that for most TEM work heating to exclude every last trace of shading may be unnecessary.

If the HT is stable, but the filament cross-over image flickers, then it is likely that the filament has not been set far enough back.

If the filament height is not set satisfactorily, cool the filament, open the gun and reset the height by no more than half a division (0.05mm), in the direction indicated above. Repeat the running-in procedure.