Molybdenum Oxide Diffraction Standard
#40830

General Instructions: Diffraction pattern ring diameter can be simply related to the lattice plane spacing in the crystal used as the specimen.

For a lattice spacing **d,** in a microscope of effective camera length **L**, and operating at an accelerating voltage corresponding to a wavelength λ **,** the diffraction ring diameter is **r,** where:

$$\lambda L = dr$$

It is not easy to measure the actual value of L or to know the precise value of accelerating voltage. However, without knowing the exact values of λ **and L,** one can determine an unknown lattice spacing by measurement of **r** if the instrument has first been calibrated with a known substance.

This can best be done by using a polycrystalline material of known lattice spacing, so that continuous diffraction rings are available for measurement. The ring diameters must all be measured in the same plane relative to the microscope to avoid any errors due to ellipticity of the pattern.

Furthermore, the calibrating ring diameter chosen should be like that required to be calibrated since there may be distortion of the relative ring diameters due to residual barrel or pincushion distortion in the projector lens system.

Molybdenum Oxide Crystals

This test specimen is most useful to determine the rotation between a diffraction pattern and the selected area image.

Select a thin crystal not overlaid by others, so that a clear Lauer diffraction pattern is obtained.

Starting from the diffraction pattern, change the strength of the diffraction lens until each diffraction spot shows a small image of the crystal. It will be possible to determine the sense of the rotation of the image as the magnification is increased. Check whether there is an image inversion between the diffraction position and the selected area magnification.

The actual magnitude of the rotation angle between the crystal and its pattern can be determined by recording both image and diffraction pattern on a single plate. The correct rotation angle between pattern and image can then be determined by taking into account the sense of rotation and any image inversion.