

Review of the Lomo PoLam Monochromator

Summary: The Lomo Polam Monochromator can be found on the New Old Stock market for reasonable prices and offers an excellent option to provide monochromatic light (15nm bandwidth) to the microscope. Dichroic filters and the ability to change the angle of incidence provides the ability to select wavelengths for most of the wavelength range between 385nm to 689nm. This makes the monochromator ideal for refractive index and dispersion studies as well as any other application where a variable monochromatic light source is needed.

Report: A few years ago I purchased the Lomo monochromator at a deeply discounted price. I have had a UV-Vis spectrophotometer connected to my microscope for almost 15 years and was interested in the ability to provide light of various wavelengths to specimens on the stage. The Lomo monochromator was an interesting option.

My working microscope is a Zeiss Photomicroscope III and the Lomo condenser dovetail is not an exact match. However a few minutes with a file on the monochromator's dovetail fitting and it was a perfect fit. Once attached to the Photomic's condenser rail, it was noticed that the positioning of the filters were just slightly off the optical axis of the photomic. The offset was not enough to be noticed in use, however for purists, the filter could be moved slightly out of the detent marking by about 2 mm to make perfect alignment. Figure-1 shows an optovar telescopic view of a 10X objective focused on the filter. The left picture is of the monochromator as is, and the right picture shows the filter wheel slightly out of the indent position for better alignment.

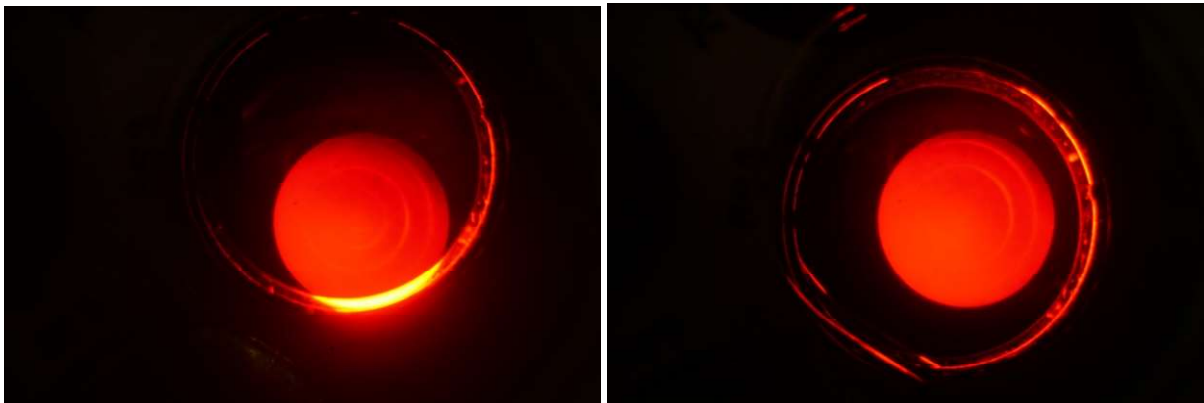


Figure-1: Telescopic view through the 10X objective showing the filter wheel in its native position (left) and slightly out of the indent (right).

The Lomo monochromator has dichroic filters with wavelength markings for each filter on the turret wheel. The unit comes with a calibration card that purports to provide “calibrated” wavelengths for each filter when positioned at 0 degrees incidence. To confirm this calibration, the filters were evaluated using a Shimadzu UV-3600Plus UV-Vis-NIR spectrophotometer at 0 degrees incidence. The results show that the actual measured transmitted wavelengths differed from what was marked on the wheel and on the calibration card, table-1. It is unclear why this difference existed.

Marked on wheel	Calibration Card	Measured
438	433.5	429.4
486	491.0	493.8
520	516.0	521.8
589	587.0	592.2
663	662.0	677.0
700	695.0	688.8

Table-1 Comparison of Filter wavelength values (values in nm)

An interesting property of dichroics is that the transmission wavelength of the filter depends upon the angle of the dichroic to the incident light. The monochromator is designed so that when it placed under the stage the filter turret assembly can be rotated from 0 degrees incidence to approximately 34 degrees incidence, Figure-2. This allows each filter to cover a range of potential transmission wavelengths.

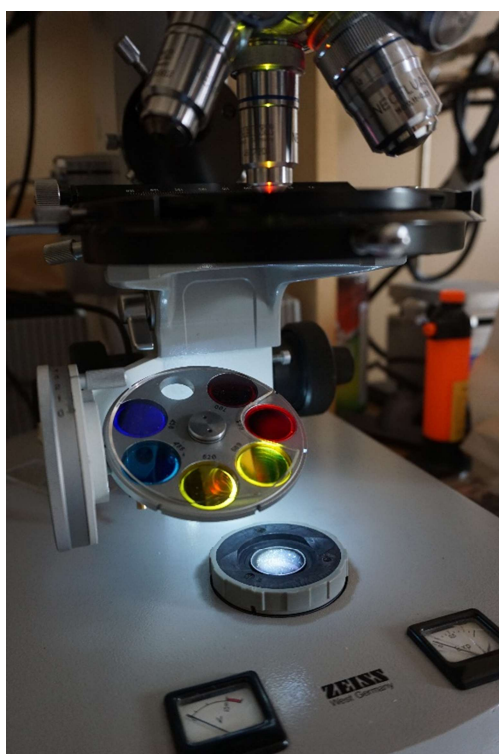


Figure-2: Lomo Monochromator installed with filter turret tilted.

The monochromator comes with no information about the use of the tilt mechanism nor any way to calculate the transmitted wavelengths per tilt angle. To understand this better the filters were placed in the spectrophotometer which was equipped with a sample holder that could be rotated to adjust the incident angle to the filter. The spectra acquired for each filter at various angles is shown in Figure-3. From this study, it is quite clear that the monochromator can be used to provide a range of transmitted wavelengths with a FWHM bandwidth of approximately 15 nm.

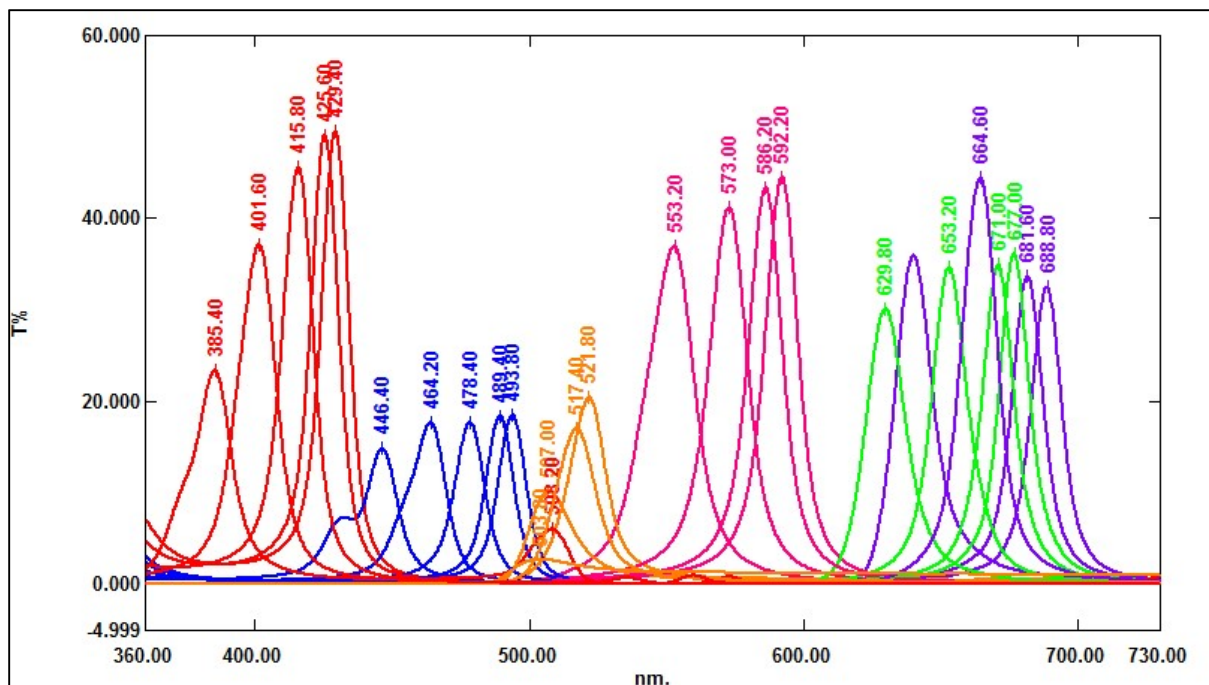


Figure-3: Spectra of each monochromator filter with varying incidence angles from 0 degrees to 30 or 40 degrees.

From the spectral data for each filter, regression formulas for wavelength versus degree of incidence were calculated. The best fit was found to be a 3rd order polynomial. Regression fits for each filter are found in Figure-4.

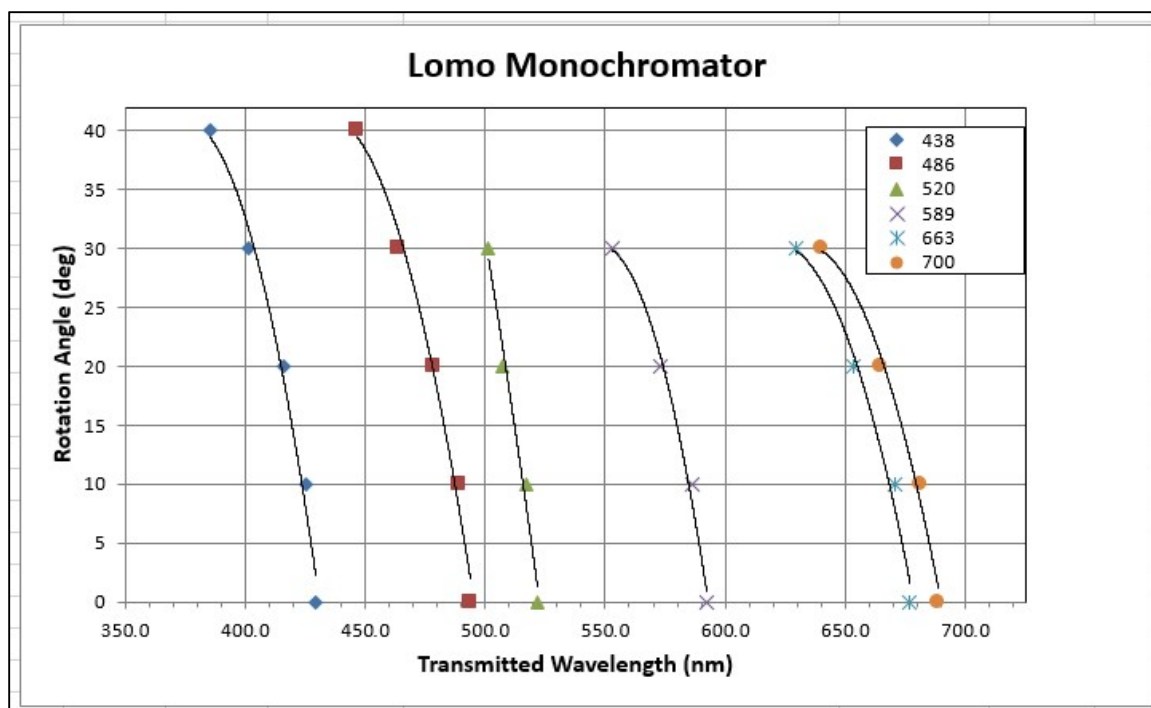


Figure-4: Regressed fits for the monochromator filters