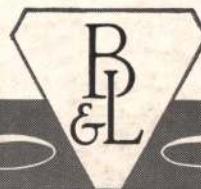


R. Murie

# CHEMICAL MICROSCOPE

MODEL MA

REFERENCE MANUAL



BAUSCH & LOMB  
OPTICAL COMPANY  
ROCHESTER 2, NEW YORK

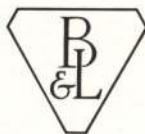
**Guarantee** ★ From raw materials to final inspection, Bausch & Lomb products are made under the rigid control of mechanical and optical experts. The formulae for the glass used in optical elements and the design and manufacture of both optical and mechanical parts contribute to one purpose—a product which will afford you the highest satisfaction.

If a product of our manufacture proves defective in material or workmanship, an appropriate adjustment will be made. This guarantee does not cover damage in transit, damage caused by carelessness, misuse or neglect, or unsatisfactory performance as a result of conditions beyond our control. —*Bausch & Lomb Optical Co.*

# **CHEMICAL MICROSCOPE**

**MODEL MA**

**CAT. NO. 31-28-53**



**REFERENCE MANUAL**

**BAUSCH & LOMB OPTICAL CO.  
ROCHESTER 2, N. Y.**

# The Bausch & Lomb Chemical Microscope Model MA

## FOREWORD

The Bausch & Lomb MA Microscope has been designed to meet the requirements of a polarizing microscope for use in chemical microscopy. It is beyond the scope of these directions to describe the many techniques and procedures which may be accomplished with this instrument. For general information as to how to achieve the best results from your microscope, we refer you to our booklet on "The Use and Care of the Microscope," which accompanies this instrument.

## Shipping

The MA Chemical Microscope is forwarded in an especially designed instrument case arranged to hold all of the commonly used accessories and to protect the microscope from dust when not in use. Upon unlocking the case, it will be seen that the instrument is held in position in the case by a heavy screw extending through the bottom of the case. This screw must be removed to permit removal of the instrument from the case. Remove the bag and the tissue packing surrounding the instrument and accessories. The objectives will be packed in objective boxes in a drawer, and the eyepieces will be wrapped in tissue and packed in another drawer. Remove the eyepieces and objectives and screw the objectives into the openings in the revolving nosepiece.

## Condenser—Polarizer

The condenser-polarizer is mounted on the focusable substage. It is composed of an iris diaphragm, heat absorbing filter, polarizer, and three

condensing lenses, two of which are mounted on a swing-out cap. With the swing-out cap in place, the illuminating N. A. is 1.10. By pulling back on the swing-out lever the cap is removed from the optical path and the illuminating N. A. is 0.28. The polarizer, a sextant grade Polaroid disc, can be rotated through 360°; when set at 0° the plane of vibration is north-south.

Warning: The polarizer is protected by a heat absorbing disc, but excessive heat is to be avoided. The polarizing elements should not be heated beyond 150° F. Diffused light sources should not be located too near the polarizer. Incandescent sources greater than 100 watts should be used only with a heat absorbing water cell in the beam. If a carbon arc is used, a 2% solution of copper sulphate must be used in water cell.

## Analyzer

The analyzer is a non-rotating sextant grade Polaroid disc mounted on a slide in the body tube. It is permanently set so that its plane of vibration is east-west.

## Manipulation

The analyzer disc may be removed from the optical path by pulling out the large knob which will be found on the lower right-hand portion of the body tube. In this way the analyzer is replaced by a clear glass disc.

This instrument is furnished with an adjustable draw tube. For ordinary work it should be set at 160mm, as the objectives are corrected for this tube length.

The stage is centerable and should be adjusted so that any object lying

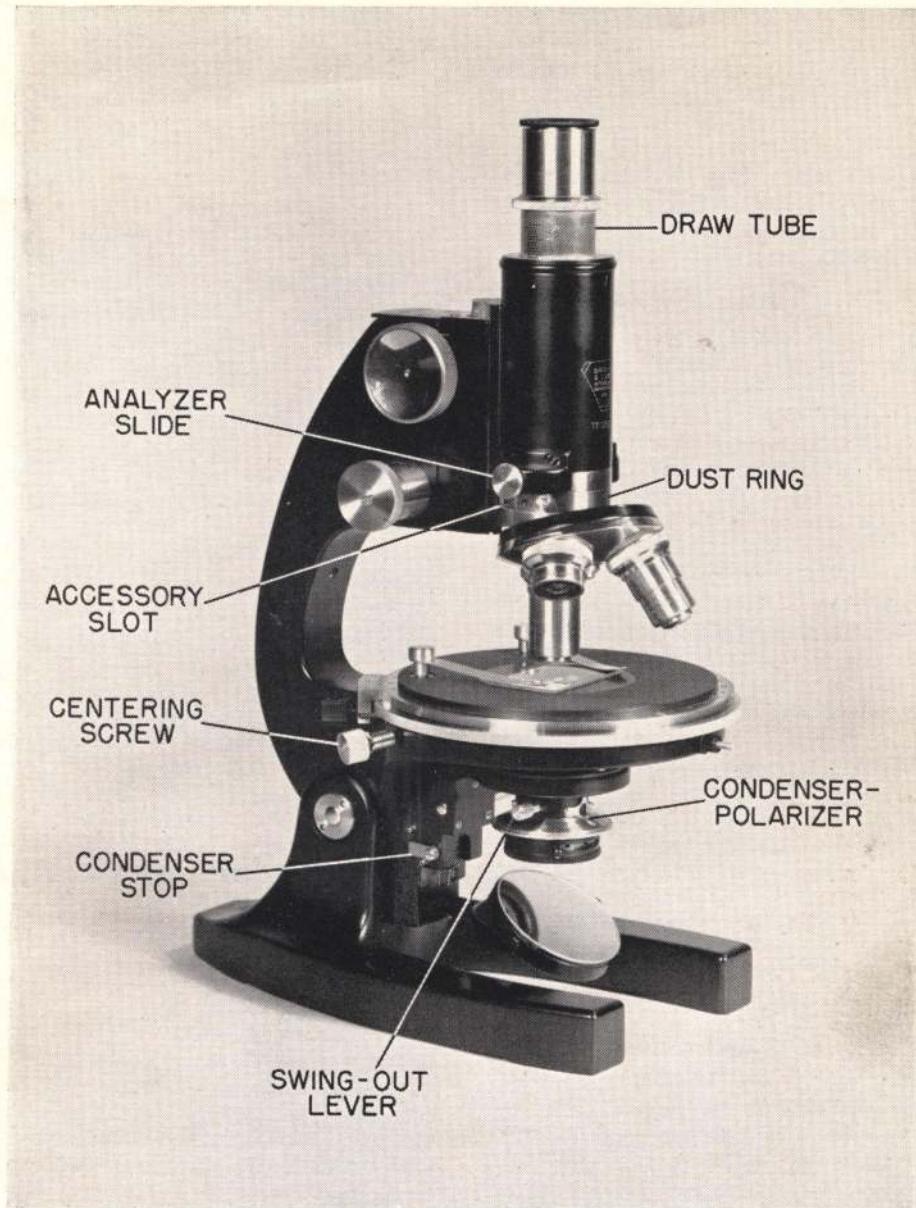


Figure 1

*The Bausch & Lomb Chemical Microscope—Model MA*

on the intersection of the cross hairs remains in that position during rotation of the stage. Make this adjustment by means of the stage centering screws, alternately making an adjustment and rotating the stage.

The entire stage may be removed by sliding it forward and lifting up at the back. A hot stage or similar accessory may then be installed for special work.

At the side of the substage rack is a condenser stop. To prevent the substage condenser from being brought up through the stage opening and touching the slide, the stop should be swung to the horizontal position (Fig. 1), so that it will contact the projecting stud when the stage is brought to its upper limit.

### Accessories

The body tube, directly above the circular nosepiece, is provided with a slot for such accessories as the quarter wave, or red of the first order plates, and the quartz wedge. These accessories are generally used between crossed polarizer and analyzer, and are oriented with their slow axes diagonal to the planes of the polaroids. Hence, generally speaking, when using these accessories, make sure that the analyzer is in the optical path and that the polarizer is set at zero.

NOTE: Accessories are not included with the microscope.

### Suggestions

Keep instrument in case when not in use. Keep all optical parts free from dust and finger prints, or the microscope will not give the best extinction when the polarizer and analyzer are crossed.

Keep the accessory slot dust ring closed when not in use.

### Extras for Your Microscope

Vertical Illuminator for metallographic work.

Microscope illuminators, cameras, slides, micrometer eyepieces, Abbe condensers, mechanical stage, objectives (including 4mm and oil immersion objectives for observing interference figures).

## Methods for Determining Refractive Indices in Polarized Light Microscopy

Dr. Philip W. West of Louisiana State University has suggested the following simple method for the determination of refractive indices:

"The determination of index of refraction for isotropic substances is carried out by the usual Becke line or half-shadow methods. In the case of anisotropic crystals, however, the customary order of procedure is reversed. A particle is first located which shows an interference figure under conoscopic observation (using a pinhole eyepiece), and from this the optical class and optic sign are determined. Next, refractive indices are determined on crystals showing the maximum flash of color during rotation between crossed nicols. By rotating such crystals to extinction and removing the analyzing prism, either the high index or low index will be shown. Further rotation of 90° to the second extinction position gives the remaining index. The indices so determined are identified from the previously determined optic sign.

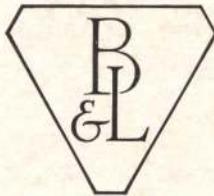
If the crystals are uniaxial positive, the lowest index found will closely approximate the value for omega; if the crystal is negative, the omega index will be very near the highest value found. In the case of biaxial crystals, the low value represents alpha and the high value approximates gamma. For biaxial positive crystals, beta will be nearer alpha than gamma, while in negative crystals it will be nearer gamma. The value for beta can usually be estimated with a fair degree of accuracy from these relationships. If desired, the value for beta can be checked on a crystal which shows an interference figure having the optic normal in the north-south position. A check on the omega index of uniaxial crystals can be made on crystals showing centered interference figures."<sup>1</sup>

For information as to the many applications of the chemical microscope, we recommend "Hand-book of Chemical Microscopy" by Drs. E. M. Chamot and C. W. Mason.

<sup>1</sup> Science, 101, March 16, 1945.

**RESPONSIBILITY FOR DELIVERY.** Every shipment of Bausch & Lomb products is in perfect condition when it leaves the factory. The transportation company, when it accepts the shipment, becomes the consignee's agent and is responsible for safe delivery.

If shipment shows evidence of rough handling, have the agent note on the receipt "Received in bad order"; or if "concealed damage" is revealed after unpacking, call the representative of the transportation company within 48 hours and have him make out a "Bad order" report. Unless this procedure is followed, you lose all right to recovery from the carrier. —*Bausch & Lomb Optical Co.*



Sketched below are the main offices and works of the Bausch & Lomb Optical Co., at Rochester, New York. There are other Bausch & Lomb plants in Rochester and Wellsville, N. Y.; Midland, Ontario, Canada; and Rio de Janeiro, Brazil. Sales offices are in many of the larger cities.

D1-543, 200, V-51

PRINTED IN U. S. A.

