numbered 5860, 5840, 5874, 9863.[2] When the lamp is used for fluorescent microscopy, it is necessary to place in the ocular(s) a 20-mm circular Corning glass absorption filter (No. 3060) to prevent injury to the eye from ultraviolet rays passing through the objective.[3]

Where a greater amount of ultraviolet light is required, we had the surface of the B & L spherical lamp housing reflector aluminized by the Alzak process and then substituted two spherical quartz condensers in place of those originally supplied. This, however, is not necessarily required for all work.

For greater efficiency in fluorescent microscopy, the microscope condenser was replaced by one made of quartz. An aluminum-surfaced disc placed over the microscope mirror or resurfacing of the mirror with aluminum by the Alzak process is also required for fluorescent microscopy.

For ultraviolet rays below 3,650 A the outer glass envelope was removed from the lamp.

The above method is the one used by us in work in this field which has been reported recently (*1*).

Reference

1. PISHA, B. V., and KELLER, R. *Anat. Rec.*, 1947, **98**, 39; *Rev. Gastroenterology*, 1947, **14**, 495; *Clin. Med.*, 1947, **54**, 394.

A New Tool for Infrared Studies

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During the last 10 years the writer has studied in infrared light the optical properties of many minerals which are opaque in visible light. The wave length used was 9,000 A (*1*).

By substituting a photoelectric ocular, sensitive to infrared light, for the ordinary eyepiece of a polarizing microscope or other optical apparatus used in mineralogical studies, it is possible to study the optical properties of many opaque minerals, using the same techniques as for nonopaque minerals. The photoelectric current produced by the optical phenomena studied is amplified and measured by the use of a sensitive galvanometer.

This method gives a high degree of precision. For example, during the measurement of refractive index, the maximum deflection of the galvanometer can be accurately noted. When using index oils, different persons estimate the point at which the index of the oil and the mineral match with slightly different degrees of precision.

During the last war, the American and German armies improved and used the sniperscope and snooperscope for night fighting.

[2] Corning glass filter No. 9863 passes ultraviolet light down to 2,500 A but passes a trace of red and violet.

[3] These filters were obtained from the Corning Glass Works, Corning, New York.

The field one wishes to observe is illuminated by a beam of infrared invisible light. By the use of a telescope containing an electronic infrared image tube, the observation of the field is about as simple as it is in daylight.

The invisible image produced by the lens of the telescope is projected on the front half-transparent cathode of the image tube. Inside the tube, the electrons pulled out of the cathode are focused by a set of electronic lenses and hit the rear fluorescent screen of the tube, producing a visible image of the observed field. The resolution is very high—nearly the same as for a television tube.

With the help of the Electronics, Physics, and Geology Departments of Washington University, the writer obtained an image tube and adapted it to a polarizing microscope (Fig. 1).

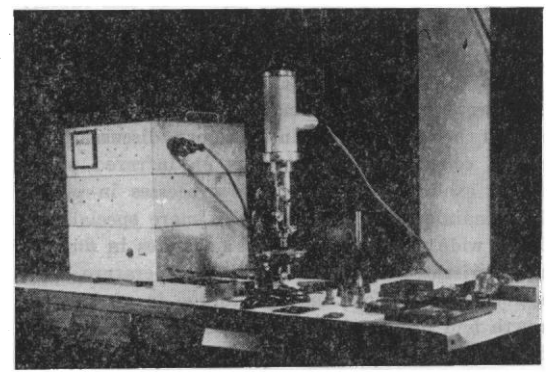

FIG. 1

The results are extraordinary. It is possible to study in infrared light a section of molybdenite (MoS_2) about ½ mm thick, as are ordinary transparent minerals. In visible light, sections of molybdenite, 1/100 mm thick are opaque. Stibnite (Sb_2S_3) is transparent in sections 3 or 4 mm thick. Natural pure antimony can be studied in sections up to about 1 mm thick.

Interference figures can be observed as in visible light.

The sensitivity of the image tube is great. The manipulation of this new infrared microscope is exactly the same as for an ordinary polarizing microscope. The only difference is the green color of the image, which is produced by the fluorescent screen.

The image tube can be adapted to the ocular of a refractometer, goniometer, and other apparatus used in mineralogy and petrology. Thin sections used in paleontology and paleobotany are particularly interesting to study in infrared light. Internal structures of Foraminifera and other small animals can be discerned. With the infrared image tube, the long, tedious study by photography with the use of special plates is eliminated.

Observation with infrared light, with this new technique, should be very useful for medicine, biology, chemistry, and allied sciences.

Reference

1. BAILLY, RENÉ. *Bull. Soc. Française Minéral.*, 1947, **70**, No. 1–6; *Amer. Mineral.*, in press.