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An Inexpensive Narrow Pass Filter for 254 m $\mu$  Ultraviolet  
(Iodine-methyl Cellulose)\*

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## INTRODUCTION

A light filter was needed for use with an ultra-violet light microscope which would pass light at about 250 m $\mu$  and absorb all other wavelengths emitted by the source. The commercial ultra-violet filters available give insufficient transmission at 250 m $\mu$  and pass too broad a range of wavelengths.

Hoshino and Yoshida (1949) and McFarland et al. (1958) used polyvinyl alcohol plus iodine to produce a filter which transmits nearly 25% at 250 m $\mu$  and <1% below 230 m $\mu$  and above 275 m $\mu$ . Following this line of investigation, we found that a methylcellulose film stained in an iodine solution will transmit 50% at 250 m $\mu$  and will block below 225 m $\mu$  and above 275 m $\mu$ .

## METHODS

### Materials.

1. Quartz slide. 2" X 2".
2. Methylcellulose. One gram of Dow Methocel, 7000 cps, dissolved in 100 ml distilled water.
3. Staining solution. One gram of iodine and 2 grams of potassium iodide dissolved in 100 ml distilled water.
4. Rinse. Absolute ethanol.

Procedure. Three milliliters of Methocel solution are placed on a quartz slide and spread to the edges with pipette or glass rod. The slide is left in a dust-free place overnight, thereby drying the Methocel down to a thin film. The dry slide is immersed in staining solution for one second, drained on edge for 5 seconds, rinsed in ethanol for 1 second, drained and allowed to air-dry.

Careful draining of the slide to remove drops of the alcohol rinse

will prevent cracking and spotting of the film. Streaks and unevenness which are apparent after staining and rinsing will disappear with drying.

Any water in the alcohol rinse tends to turn the filter blue, so care should be taken in keeping the alcohol dry, and in keeping the finished filter from water. It is convenient to apply a piece of tape to the back surface of the slide as a means of holding the filter during staining and rinsing.

The Methocel film is very sensitive to the stain solution and alcohol rinse and several attempts will probably be required before the proper timing in each of the liquids is achieved and the desired filter produced. With insufficient staining ( or too much rinsing ) a small window of transmission at  $328\text{ m}\mu$  begins to appear. As this peak rises, the peak at  $250\text{ m}\mu$  also increases and may transmit as much as 55% while the window at  $328\text{ m}\mu$  is at 1%. Over-staining (or insufficient rinsing) yields a flat line of zero transmission from  $275\text{ m}\mu$  to  $370\text{ m}\mu$ , but also lowers the peak at  $250\text{ m}\mu$  to 40% or under.

Some filters tend to show a small residual pass at  $310\text{-}330\text{ m}\mu$ ; this can be blocked by an auxiliary filter of methyl cellulose incorporating cation X\* (Kasha, 1948), 1 mg per ml.

We have found the General Electric G4S11 lamp (an "ozone-producing" lamp used in refrigerators and other appliances) to be an inexpensive source of the  $254\text{ m}\mu$  mercury line for use in photomicrography in conjunction with these filters, and the Zeiss "ultrafluor" quartz-fluorite achromatic objectives.

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\* May be purchased from California Corporation for Biochemical Research, Los Angeles, California.

This lamp is more compact and somewhat brighter at this wavelength than the germicidal lamps that are widely used for similar purposes.

Other filters, for similar applications, have been described and reviewed by Childs (1961). The use of single crystal  $\text{NiSO}_4$  allows for sharper suppression of side bands, but is correspondingly more elaborate. Interference filters useful in this range are still not very satisfactory and remain quite costly. The present filters offer a rough and ready source of 254  $\text{m}\mu$  for a variety of applications in biology and biochemistry.

## REFERENCES

- Childs, Charles B., 1961. Broad-band ultraviolet filters. J. Optical Soc. Am. 51: 895.
- Hoshino, Y. and S. Yoshida, 1949. The ultraviolet filter for isolation of 2537-A line of the mercury quartz lamp. J. Electrochem. Sci. (Denki-Kagaku), 17: 221.
- Kasha, M., 1948. Transmission filters for the ultraviolet. J. Optical Soc. Am. 38: 929-934.
- McFarland, Robert H., Richard A. Anderson, Mohammed Nasim, and Donald G. McDonald, 1958. Improved uv filter for isolation of the 2537-A line of a mercury low-pressure lamp. Rev. Sci. Inst. 29: 738-739.