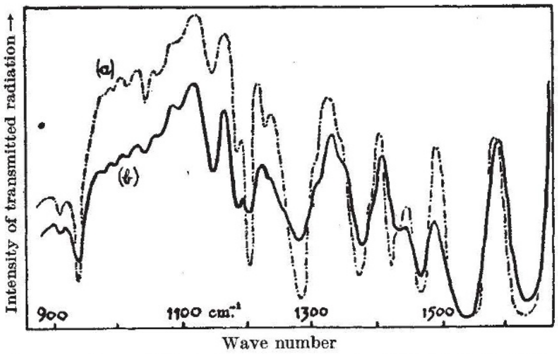
thousandths of an inch less than the diameter of the fibres to be mounted.

In preparing a specimen it is convenient to clamp the mount to a glass plate and place it in the field of view of a binocular microscope. Single filaments, 4–6 in. in length, are then inserted one by one into the slots, bringing the first right up to the edge of the spacer metal and packing each succeeding filament as closely as possible to the last. Adequate packing can be obtained by inserting periodically a second strip of spacer metal into the jaws of the mount, using this to press the filaments closely together. Each filament can be held after mounting by embedding its ends in lumps of 'Plasticine' on the glass plate.

The number of filaments that must be mounted in this way will depend on their diameter and on the spectrometer slit width ; for nylon filaments 0·008 in. in diameter it is sufficient to mount 40–50. When the required number have been placed in position, a final piece of metal foil is inserted to help preserve the alignment of the mounted filaments, and also to prevent any radiation passing directly into the spectrometer around the edges of the grid in the event of the specimen being moved while measurements are in progress.

The filaments are then stuck down to the outside edges of the steel plate by a thick cement, after which the cemented portion is covered with transparent adhesive tape. The loose filament ends and the protruding ends of the spacer metal are trimmed off.

The radiation scatter from the filaments so mounted is not excessive, and the effective thickness is low enough to allow reasonably small slit widths to be used, so that satisfactory spectra can be obtained from it directly. If desired, however, the scatter can be reduced by moistening the filaments with 'Nujol', and placing a small rock-salt window on each side, holding the windows in position by a small brass clamp.



A comparison of the instrumental records obtained from (*a*) a nylon film and (*b*) a grid of nylon filaments. (*a*) Nylon film, 20 μ thick ; spectrometer slits 0·3 mm. (*b*) Grid of 20 μ diameter filaments : spectrometer slits 0·4 mm.

In the accompanying drawing, the transmitted radiation obtained from a filament grid (continuous line) is compared with one from a nylon film (broken line). For the grid, composed of filaments 20 microns in diameter, the spectrometer slits were set at 0·4 mm. ; for the film, 20 microns thick, the slits were 0·3 mm. wide.

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Measurement of Small Surface Angles

It has been established that multiple-beam fringes of equal chromatic order are particularly sensitive for the evaluation of small surface angles. Yet they suffer from a disadvantage in that the angle shown by the fringes depends upon the orientation of the surface relative to the spectrograph slit. In fact, a resolved component of any surface angle appears, and in general it is necessary to rotate the surface under observation to find the maximum corresponding to the true surface angle.

This difficulty can be avoided by the combined use of superposition of fringes of equal chromatic order with Fizeau fringes, on the same photographic plate, as follows. Consider a simple wedge between two planes, one vertical with the edge perpendicular to the spectroscope slit. This leads to the formation of a family of fringes of equal chromatic order the shape of which depends upon the wedge angle and the spectrograph dispersion. If y_1 is the vertical distance between two fringes, then the wedge angle is $\tan^{-1} \lambda_1/2y_1$. However, in the general case the edge of the wedge is not perpendicular to the slit, and if φ is the angle made by the edge and the slit, then the true angle of the wedge θ is given by the relation $\tan \beta = \tan \theta \sin \varphi$, where β is the apparent angle given by the fringes of equal chromatic order, that is, $\tan \beta = \lambda_1/2y_2$, when y_2 is the vertical distance between two fringes. However, the Fizeau fringes from a wedge are straight lines parallel to the edge ; hence the angle φ is simply the angle made by the Fizeau fringes with the slit, that is, with any spectral line. Clearly a superposition of the two systems enables φ to be measured.

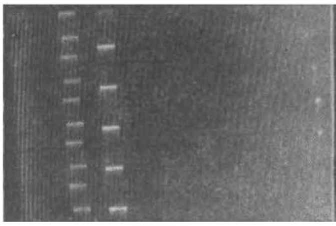

Fig. 1

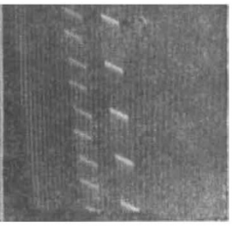

Fig. 2

This is obtained very easily in practice. The narrow fringes of equal chromatic order are first photographed with the usual source of white light, using a narrow slit. Without moving either the interference system or photographic plate, the slit is opened wide and the source of white light replaced by a mercury arc. Fizeau fringes are thus superposed on the fringes of equal chromatic order, as shown in Fig. 1. This is the special case of a wedge set with $\varphi = \pi/2$, and the Fizeau fringes are horizontal. The Fizeau fringes assist in identifying the intercept of a vertical line with successive fringes of equal chromatic order. In the case shown $\tan \theta = 0{\cdot}001$.

Fig. 2 illustrates the appearance when the wedge happens to be set with $\varphi = 60°$, and it is easy to see how the formula given above enables θ to be derived. Even with such low dispersion, the angle calculated from Fig. 2 agrees with that from Fig. 1 to within about 1 per cent.

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