A working model has been constructed as follows: a 'Polaroid' and a black paper disk, the latter with a slit in it, are held between two transparent plastic disks and all these parts are mounted together on a shaft so they can rotate between two fixed sheets of plastic. These in turn are mounted at the end of a black sheet-metal viewing cone. Rotation of the slit is effected by a small battery-operated motor through a rubber-band drive.

As one scans the blue sky with this viewer the plane of polarization of light can be detected over much of the sky, and differences in percentage of polarized light from different directions are apparent from the amount of contrast between the light and darker zones of the visual field. What one sees is dependent on integration of light from the rotating slit by the eye, and there are undoubtedly several factors which influence detection of plane of polarization when percentage of polarized light is small. When it is large, as in blue sky at or near the zenith when the sun is rising or setting, quite accurate determinations of polarization plane are undoubtedly possible, so that the device could be used as a sky compass[4]. A logical modification would be to use a rotating hemisphere instead of a disk, so that the whole sky pattern, not just that in a small section, could be seen at once.

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Thickness Measurement of Epitaxially Grown Films

Many substances are known to grow epitaxially when deposited on suitable single crystal substrates. A review of epitaxial growth has been given by Pashley[1]. The single-crystal film is of importance since its behaviour is easier to interpret than that of a polycrystalline film, in which both crystallite size and orientation are variable. Rock-salt crystal is frequently used as a substrate because the film can be easily removed from its surface by dissolving the underlying crystal. It is essential that the film be removed for study, in order that the strain associated with the epitaxial process be removed by annealing. Measurement of the thickness of such films raises a slight difficulty because a cleaved rock-salt surface, although flat over very small areas, is rarely flat enough to enable the usual multiple-beam fringe methods[2] to be applied directly.

In experiments on iron and nickel films, the thickness has been determined as follows. The film is floated off the rock-salt and is picked up on a glass flat. The flat is stood vertically in a desiccator and allowed to dry. The edge of the film is silvered and Fizeau fringe measurements of the step-height made in the usual way. As shown in Fig. 1, there is some deterioration in the film surface, but this does not prevent accurate measurement of the film thickness. In order to determine whether the procedure gives the thickness correctly, films were prepared on glass flats simultaneously with those on rock-salt. The thicknesses of the films on glass were

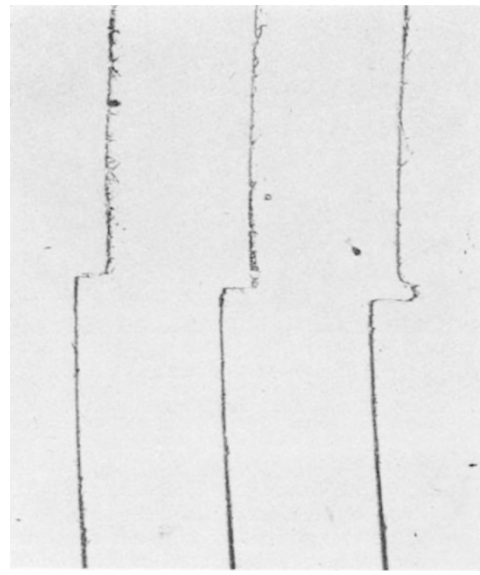

Fig. 1

determined directly by Fizeau fringes and were compared with those of films which had been removed from the rock-salt. Within the accuracy of measurement (±20 A.) over the range of thicknesses used (130–450 A.) the two sets of results agreed.

For these experiments, the films were deposited on glass and rock-salt plates at room temperature. Under this condition the assumption that all the incident molecules condense is justified. This assumption is found not to be valid when the surfaces are maintained at high (400–500° C.) temperatures.

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Molar Sound Velocity of Solids

According to Rama Rao[1] an empirical relationship exists between the temperature coefficients of the velocity of sound (v) in organic liquids and their density ρ:

$$\frac{1}{v}\frac{dv}{dT} = \frac{A}{\rho}\frac{d\rho}{dT} \qquad (1)$$

where A is practically equal to 3 for unassociated compounds.

It follows that the functions $\frac{v^{1/3}}{\rho}$ and $\frac{v^{1/3}M}{\rho}$, the specific and molar sound-velocities respectively, are independent of temperature. The molar sound-velocity can be calculated from atomic increments[2], bond increments[3] or radical increments[4] and can therefore be utilized in structural determinations on organic compounds.

For solid substances, in particular high polymers, A is considerably higher[5] than 3. A theoretical interpretation of this factor can be given starting from the relationship: