We carried out similar experiments with a sample of the synthetic fluorphlogopite prepared by Middel[5] and found that in this case magnetite inclusions were substantially absent, although the iron content was about the same (0·05 per cent), since the mineral was diamagnetic at all fields. This is no doubt due to the very much slower cooling rates used by Middel during the crystallization of the mica. (He prepared melts of up to 100 kgm., while Eitel and Dietzel and ourselves prepared melts of only about 200 gm.) The specific susceptibility of Middel's synthetic mica was measured by us, using the Rabi method. Different values for the specific susceptibility parallel to the cleavage plane were obtained for different crystals, ranging from $-0 \cdot 17 \times 10^{-6}$ to $-0 \cdot 29 \times 10^{-6}$ C.G.S. units. This variation would indicate that the small iron content is unevenly distributed throughout the mica crystal lattice.

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[1] Wilson, E., *Proc. Roy. Soc.*, A, **96**, 429 (1920).
[2] Nilakantan, P., *Proc. Ind. Acad. Sci.*, A, **8**, 39 (1938).
[3] Eitel, W., and Dietzel, A., Appendix to B.I.O.S. Report 785 (1946).
[4] Kendall, J. T., and Spraggon, W., paper read at XIth International Chemical Congress, London (1947).
[5] Middel, V., reported by H. A. Curtis, *Chem. and Met. Eng.*, **109** (March 1946).

A Large Field Compensator for Measurement of Birefringence

IN the measurement of stresses in glass using polarized light, it is usual to employ some form of compensator in which the amount of birefringence varies uniformly across the field of view and passes through zero value at the centre. This gives a series of parallel fringes when viewed suitably between crossed polarizer and analyser. With white light the central fringe is black, and serves as a useful index.

In the Babinet compensator the uniform variation of birefringence is obtained by superimposing two narrow-angle quartz wedges, cut with their optic axes at right angles, with the thick edge of one adjacent to the thin end of the other. The same effect can be obtained by uniformly bending strips of a photo-elastic material in a plane perpendicular to the direction from which it is to be viewed. The central black fringe corresponds to the neutral plane of the bent beam so formed, and fringes due to tension and compression are seen on either side of it. A compensator based on this principle has been described by Holmes[1] and consists of a strip of plate-glass uniformly bent in a suitable bending device, with the plane of bending parallel to the polished faces of the glass.

It has been found possible to produce the same effect by bending a strip of the resin *CR*. 39 in a similar way. The strain pattern can be 'frozen' into this material and the bending device afterwards discarded. A clamp is used which, by means of a screw, can be made to apply equal and opposite couples to the two ends of a strip of the material, so that it is bent uniformly in a plane parallel to the original faces of the sheet from which it was cut. The clamp holding the strip loosely in an unstrained condition is placed in an oven maintained at 105° C. After about ten minutes the sample is removed from the oven and the screw quickly tightened to give the desired strain pattern in the strip. After cooling to room temperature and removal from the clamp, the strip retains the strain pattern, which does not alter appreciably after the first 24 hours. Most of the unwanted end portions where the couples were applied, and where the bending is not uniform, may then be sawn off without affecting the system of parallel fringes extending over the remainder of the strip.

Strips 14 in. × 2 in. of various thicknesses have been used; but the dimensions are limited only by the sizes of clamp and oven available. With this size, parallel fringes cover an area of approximately 8 in. × 2 in., and up to three fringes on either side of the neutral fringe have been obtained in a thickness of ¼ in. A limit is set to this number by the flexural strength of the material when hot. The curvature of the strip with this amount of strain is apparent, but for most applications is not objectionable. By using a number of strips built up into a single unit the number of fringes may be increased; or alternatively the amount of curvature for the same number of fringes may be decreased.

Two strips of 'Polaroid' with their planes of polarization suitably orientated may be used as polarizer and analyser with the compensator. This combination forms a direct vision strain-viewer with a large field of view which may be used with any bright background and needs no projection system. One of the strips of 'Polaroid' may conveniently be mounted on one surface of the compensator and the other in a suitable holder, so that the whole apparatus comprises two compact units. Since no setting up is required, the compensator used in this way is useful for the rapid examination of stresses in glass both under laboratory and also under factory conditions.

The compensator described is superior to the quartz type as regards size of field, and may be of some interest for the evaluation of the degree of birefringence in problems other than the special application in this laboratory.

The work on this compensator was carried out in the Research Laboratory of Messrs. Pilkington Brothers, Ltd., who have kindly agreed to publication.

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[1] *J. Sci. Instr.*, **17**, 227 (1940).

New Bands in the Schumann–Runge System of the Oxygen Molecule

OXYGEN produced by heating potassium permanganate crystals was excited by a high-frequency (750–850 kc./sec.) discharge (output power less than 10 watts) and the spectra protographed both in the visible and in the ultra-violet regions by a Fuess glass prism spectrograph and a small (baby) quartz prism spectrograph respectively. A good many of the more intense bands of the Schumann – Runge system were found on both our plates. On attempting to extend the system, we discovered that a number of new bands present on our plates, but not reported by previous workers, fitted in the $(v'v'')$ scheme of this system. These new bands (ν_{vac}) along with our proposed quantum assignments are given in the accompanying table.