

Fig. 1. The stress optical coefficient of vitreous silica

were determined by measuring the fringe shifts for known additional loads<sup>2</sup>, and the value of  $C$  was measured by adopting the method used by Filon and Harris, which was suitably modified to get more accurate results. In both cases a photographic technique was used.

The value of  $q_{12}$  increases from  $2.35 \times 10^{-13}$  at 2300 A. to  $2.49 \times 10^{-13}$  at 5500 A., and that of  $q_{11}$  increases from  $-0.24 \times 10^{-13}$  at 2300 A. to  $+0.11 \times 10^{-13}$  at 5500 A. ( $q_{12}$  and  $q_{11}$  are given in c.g.s. units). The variation of the stress optical coefficient  $C$  obtained from direct measurements is shown in Fig. 1. Mean values from Filon and Harris's paper have been used for plotting the curve in the region 5500–6500 A. The value of  $C$  decreases from 4.54 brewsters at 2300 A. to 3.55 brewsters at 6500 A. As is to be expected, the dispersion of the stress optical coefficient increases as one approaches the transmission limit in the ultra-violet. The present investigation, besides providing data for the value of  $C$  over the entire region of transmission of fused silica in the visible and ultra-violet, clearly establishes the existence of dispersion of its photoelastic constants.

There is a very good agreement between the values of  $(q_{12}-q_{11})$  calculated from the measured values of  $C$  and those obtained directly from the measured values of  $q_{12}$  and  $q_{11}$  for the different wave-lengths. The quantity  $(q_{12}-q_{11})$  exhibits a dispersion of about 10 per cent in the region of wave-lengths studied.

Details of this work describing the methods of measurement, etc., will appear in due course in the *Journal of the Indian Institute of Science*.

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<sup>1</sup> Filon, L. N. G., and Harris, F. C., *Proc. Roy. Soc., A*, **130**, 410 (1931).  
<sup>2</sup> Ramachandran, G. N., *Proc. Ind. Acad. Sci., A*, **25**, 208 (1947).

### Ionization Gauge Detector for Gas Chromatography

THE development of high-sensitivity detectors for the chromatographic analysis of gaseous mixtures is of importance in the determination of substances present in very small amounts. A sensitive ionization gauge detector has been developed in this laboratory which makes use of the fact that the ionization potential of the helium carrier gas (24.5 volts) is very much greater than that of most other volatile substances. The ionization potentials for hydrocarbons, for example, range from 8 to 14 volts.

The gauge and adjustable metal leak associated with it are shown in Fig. 1. A very small fraction of the gas stream from the chromatographic column passes through the leak into an R.C.A. 1949 ionization gauge with the glass envelope modified so that the gas flows between the gauge components. The potential difference between the filament and the grid is adjusted to approximately 18 volts, a value not sufficient to produce ions when helium only is flowing through the gauge and consequently there is no plate current. When a substance of lower ionization potential is carried into the gauge, ions are formed. The ion current from the plate is amplified in the usual manner and recorded on a Leeds and Northrup 'Speedomax' recorder.

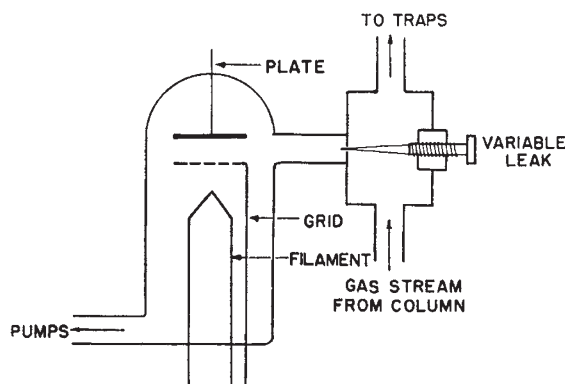


Fig. 1. Schematic diagram of gauge and leak

Typical operating conditions for the gauge are: pressure in the envelope, 0.2 mm. mercury; filament emission 5 m.amp.; grid potential +18 volts; plate potential -27 volts.

The sensitivity obtained so far is at least 200 times that given by a thermistor-type thermal conductivity cell, and compares favourably with the value reported recently by Harley and Pretorius<sup>1</sup>. This sensitivity has been achieved by using only a very small fraction (less than 0.5 per cent) of the gas stream emerging from the column, thus leaving almost all the effluent stream unchanged and available for subsequent trapping and identification if this is desired. A significant feature of the gauge is that its performance is insensitive to ambient temperature changes and also to changes in pressures and flow-rate in the main gas stream. This latter factor is of great importance in analyses done with rising column temperature during which marked reductions in flow-rate occur.

It may be possible to increase the sensitivity of the gauge by incorporating screen and suppressor grids. A further increase should be obtained by replacing the tungsten filament with an iridium filament to increase the stability of the emission.

A detailed report will be published later. We are grateful to Messrs. D. C. Frost and E. W. C. Clarke for advice and assistance.

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<sup>1</sup> Harley, J., and Pretorius, V., *Nature*, **178**, 1244 (1956).