many low-lying vibrational levels. In C_5H_5NiNO the ring has the effect of restricting the number of low-frequency modes.

We wish to thank Prof. G. Wilkinson for his interest in this work, and for the gift of materials.

A. P. Cox
L. F. Thomas
J. Sheridan

Department of Chemistry,
The University,
Birmingham 15.
Jan. 28.

[1] Brockway, L. O., and Anderson, J. S., *Trans. Farad. Soc.*, **33**, 1233 (1937).
[2] Magee, C. B., thesis, Purdue University (1955); *Diss. Abst.*, **15**, 991 (1955).
[3] Addison, C. C., and Lewis, J., *Quart. Rev. Chem. Soc.*, **9**, 136 (1955).
[4] Alderman, P. R. H., and Owston, P. G., *Nature*, **178**, 1071 (1956).
[5] Orgel, L. E., *J. Inorg. Nucl. Chem.*, **2**, 315 (1956).
[6] Dunitz, J. D., Orgel, L. E., and Rich, A., *Acta Cryst.*, **9**, 373 (1956).
[7] Hedberg, K., and Hedberg, L., quoted by Pauson, P. L., *Quart. Rev. Chem. Soc.*, **9**, 398 (1955).
[8] Fischer, E. O., Beckert, O., Hafner, W., and Stahl, H. O., *Z. Naturf.*, **10b**, 598 (1955).
[9] Linnett, J. W., *Trans. Farad. Soc.*, **52**, 904 (1956).
[10] Godycki, L. E., and Rundle, R. E., *Acta Cryst.*, **6**, 487 (1953).

Rectifying Effects of Sodium Chloride Crystals

Sodium chloride crystals were grown from the melt according to the Kyropoulos method. Part of the crystals was coloured electrolytically during growth, while other parts remained uncoloured. The specimens were 0·8 mm. thick and their area was about 3 mm.^{2}.

The current-voltage characteristics of such crystals were measured with a simple series circuit. One side of the crystals was coated with gold by evaporation *in vacuo* and placed in contact with a platinum plate, which acted as a low-resistance base electrode. The other electrode used in these experiments was prepared from a platinum wire 0·2 mm. in diameter one end of which has been filed to a point or from a tungsten wire 0·1 mm. in diameter, brought electrolytically to a fine cone at one end. There were no detectable differences in the results of measurements made with these two sorts of point electrode.

Sodium chloride crystals behave as insulators at room temperature; at elevated temperatures, however, their conductivity changes in accordance with van 't Hoff's law. The measurements were carried out at 250° C., at which temperature the specific conductivity of the crystals is about $10^9\ \Omega^{-1}$ cm.$^{-1}$.

In Fig. 1, curve *a* refers to a coloured crystal, curve *b* to an uncoloured specimen. Measuring the current-voltage characteristic in the forward direction with crystals at a positive potential with respect to the point-electrode, the shapes of the characteristic of the coloured and uncoloured crystals are very similar. Rectification ratios (at 100 volts) obtained for coloured crystals are about 30 : 1; for uncoloured specimens this ratio was about 15 : 1 at the same voltage. For both coloured and uncoloured crystals the ratio of the forward to the reverse resistance decreases with increasing voltage.

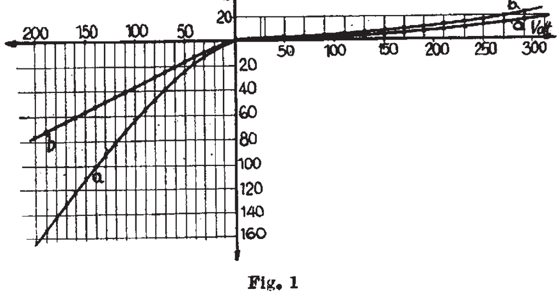

Fig. 1

A prolonged current in the reverse direction (when the crystal is negative relative to the point contact) increases the reverse resistance, and at the same time the forward resistance changes so as to increase the rectification ratio for both coloured and uncoloured specimens. A strong forward current, on the other hand, decreases the forward resistance as well as the reverse resistance, so that the rectification ratio is reduced. The curves (Fig. 1) refer to crystals which have been subjected to a reverse current at 400–500 volts.

As a result of repeated measurements on the same crystals, colour centres are formed around the point contact, which migrate towards the plate electrode.

I wish to thank Prof. Z. Gyulai, director of this Institute, Dr. J. Boros and Dr. P. Tomka for valuable discussions, and B. Jeszenszky and J. Kiss, who grew the crystals for these investigations.

S. Császár

Institute for Experimental Physics,
Technical University, Budapest.
Jan. 21.

An Optical Method of obtaining the Frequency Response of a Lens

The image-forming properties of many types of lens have been measured in this laboratory, with particular reference to their suitability for use in television equipment such as cameras, film scanners, telerecorders, etc. The spatial frequency response of a lens is one of the most important characteristics to be determined; and the basic photoelectric methods of measuring this response function have been largely developed in Britain by Sproson[1].

The particular method we have used for the past two years consists of measuring the lateral intensity distribution of the image formed by the lens when an incoherently illuminated narrow slit is used as the test-object. (The method is analogous to the unit impulse method of testing four-terminal electrical networks.) The intensity distribution is recorded automatically, but the Fourier transform to obtain the frequency response is carried out by a computational procedure using a calculating machine. Although this method yields a high degree of accuracy, the computational work involved in the transform of the space functions can be tedious, especially when a lens is tested in detail over its working field. Attention has been focused recently on test apparatus for obtaining the frequency response automatically and directly: several ways of doing this[2] have been suggested, which mostly involve either continuous scanning mechanisms or reciprocating components. The Fourier transform can be carried out, however, solely by optical means in a very simple and elegant manner. The proposed method of instrumentation is based on a device due to Born *et al.*[3].

Fig. 1 shows the layout of the apparatus. A long, narrow slit test-object is illuminated incoherently by