

The diluted crystals show four hyperfine components, due to the $I = \frac{3}{2}$ of ^{63}Cu and ^{65}Cu . With present sensitivity the line-width cannot be reduced much below 50 gauss, and so far no fine structure, due to any covalent linkage with the nitrogen atoms, has been observed. The maximum splitting between successive hyperfine components is 210 ± 10 gauss, and the maximum g value is 2.165 ± 0.004 , both occurring along the axis through the copper atom normal to the plane of the four nitrogens. In the plane perpendicular to this axis, that is, the plane of the molecule, the g -value remains isotropic at 2.045 ± 0.003 . The hyperfine splitting in this plane collapses to an ill-resolved pattern, as is usual in copper salts, having an approximate value of $B = 30 \pm 10$ gauss. However, there does seem to be a 180° variation of this splitting for rotation in the plane of the molecule. The difference is small but appears to be outside the experimental error, and is being studied more closely, as it may give information which differentiates the individual copper-nitrogen bonds.

The same g values and hyperfine splittings are obtained at both 1.25 cm. and 8 mm. wave-lengths, and also over a temperature-range of 20° – 290° K. They can be summarized in terms of the normal spin Hamiltonian coefficients as:

$$g_{\parallel} = 2.165 \pm 0.004; \quad g_{\perp} = 2.045 \pm 0.003 \\ A = 0.0208 \pm 0.001 \text{ cm.}^{-1}; \quad B = 0.0031 \pm 0.001 \text{ cm.}^{-1}$$

The quadrupole interaction coefficient, Q , has not been calculated yet, as more sensitive apparatus is being constructed to allow greater dilution and better resolution. It is then hoped to carry out a detailed study of the hyperfine splitting in the molecular plane, and also search for any interaction of the electrons with the nitrogen nuclei.

This work forms part of a general programme for studying phthalocyanine, haemoglobin and chlorophyll derivatives by paramagnetic resonance. We would like to thank the Royal Society for a grant towards the cost of the apparatus, Imperial Chemical Industries, Ltd., and Dr. C. E. Dent for supplying phthalocyanines, Dr. Stevens for much helpful discussion, and the Department of Scientific and Industrial Research for a maintenance grant (J. E. B.).

J. E. BENNETT
D. J. E. INGRAM

The University,
Southampton.
Dec. 13.

¹ Linstead, R. P., Lowe, A. R., Dent, C. E., and Byrne, C. T., *J. Chem. Soc.*, ii, 1016 (1934).

² Eleaney, B., Bowers, K. D., and Ingram, D. J. E., *Proc. Phys. Soc. A*, **64**, 758 (1951).

³ Ingram, D. J. E., and Bennett, J. E., *J. Chem. Phys.*, **22**, 1136 (1954).

⁴ Robertson, J. M., *J. Chem. Soc.*, i, 615 (1935).

Fixation in Electron Microscopy

MANY specimens for electron microscopical examination are in the form of suspensions in salt solution. These are commonly dried on the specimen support film, and the unwanted salt crystals are removed by washing, with resultant uncertainties due to loss of material during the process, which losses may well be selective. The salts are sometimes first removed from the suspensions by dialysis; but this may lead

to changes in aggregation, or to loss by precipitation before the material can be finally laid down.

These difficulties have been largely overcome here by working on a micro scale and using the mounting film itself as the dialysis membrane. The film is floated off a glass support on to a water surface in the usual way, and a single drop (or sometimes a spray of micro-drops) is placed on top of the film. The salts diffuse through the film very rapidly as it is usually only 300 Å. thick, and the specimen is then mounted in the normal manner.

Further, it is often desirable to fix such specimens without change of electrolyte balance in the process. This is now readily achieved by placing drops of the suspension on a mounting film floating on a bath of the suspending medium, which contains the fixative in addition to the normal concentration of salts. Fixation proceeds gradually by diffusion of the agent through the film and the bottom of the drops, or in the vapour phase through the top of the drops, without change in electrolyte balance. Removal of unused fixative and unwanted salts is accomplished by transferring the film to a water surface as before. The concentration of the fixative gradually rises in the drops from zero to that of the main bath. Such progressive fixation has been shown to be most desirable, and the dangers inherent in adding concentrated fixative to the suspension itself are avoided.

Similarly, other micro-chemical modifications of the specimen material may be carried out without fear of selective loss by precipitation and consequent rejection prior to normal mounting procedures, since the insoluble contents of the original drops necessarily remain on the mounting film.

The method has been used to advantage over the past two years in studies of tumour and normal tissue extracts, isolated cell components (lipid fraction, mitochondria, microsomes), bacteriophage behaviour at various pH-levels (precisely controlled by working with standard buffer solutions) and the organisms of pleuro-pneumonia and related materials.

F. W. CUCKOW

Chester Beatty Research Institute,
Royal Cancer Hospital,
Fulham Road,
London, S.W.3.
Oct. 29.

Allotropes of Tungsten

THE element tungsten has been observed to exist in two structural forms: the commonly encountered modification, which is body-centred cubic with $a = 3.16$ Å., and another which has a more complex cubic structure with 21 atoms per unit cell and $a = 5.04$ Å. These forms have been designated α and β respectively by Hartmann, Ebert and Bretschneider¹, who first reported the existence of the β -form, and this nomenclature is commonly accepted, although Neuberger² reverses the designations.

Hartmann and others have shown that the β -form is stable below *c.* 650° C., above which temperature it is irreversibly converted to α -tungsten, the transition being relatively sluggish. No reports have yet been published that α -tungsten can be reconverted to β -tungsten by purely physical processes, so that it has only been obtained hitherto by winning the element at temperatures below the transition temperature. Metallic tungsten prepared at these tem-