the serum and urine of a patient with orthostatic albuminurea.

An electrophoresis cell is now under construction which will allow four electrophoretic analyses to be performed simultaneously. With this type of cell the sera may be removed by a long pipette after a run and immediately replaced by a second batch of four samples. In this way we hope to be able to analyse at least eight sera during the course of a normal working day.

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[1] Polson, A., *Nature*, **168**, 996 (1951).
[2] Polson, A., *Onderstepoort J.*, **20**, 159 (1945).
[3] Kahn, D. S., and Polson, A., *J. Phys. Coll. Chem.*, **51**, 816 (1946).

Structure of White Phosphorus : Single Crystal X-Ray Examination

Several attempts to obtain X-ray diffraction patterns of crystalline white phosphorus have been made[1]. It is claimed by some that the ready reversion of the white to the red form under irradiation with X-rays prevents any pattern being obtained, while others suggest that the high degree of thermal motion in the crystal lattice will render it impossible to obtain anything but a few very diffuse rings. Natta and Passerini[2], however, state that they obtained a well-defined powder photograph of white phosphorus with 22 lines, using iron $K\alpha$ radiation at − 35° C. They claim that the substance is cubic with $[a] = 7{\cdot}17$ A., containing four molecules of P_4 per unit cell, but give no other data.

By using copper $K\alpha$ radiation at − 30° C., we have obtained X-ray diffraction patterns from single crystals of white phosphorus. Our results do not confirm those of Natta and Passerini. Sticks of highly purified white phosphorus were sealed in glass tubes under vacuum and crystals grown by slow sublimation. A wide variety of crystalline habit was observed. Needles, rectangular plates and various polyhedra were obtained, all of which gave similar X-ray patterns. It was found that these single crystals would remain stable, usually for two or three days, if they were given a thin coating of methanol–shellac solution. The crystals were cooled in a stream of dried air at − 30° to − 35° C. during exposure, and well-defined oscillation and rotation photographs were obtained on a standard camera of 3 cm. radius. Attempts to obtain powder photographs using Natta and Passerini's technique[2] were unsuccessful.

The X-ray photographs indicated a body-centred cubic lattice with $[a] = 18{\cdot}51 \pm 0{\cdot}03$ A. Systematic absences of the reflexions were $\{hkl\}$ when $\{h+k+l\}$ was odd. A Laue photograph revealed the presence of a fourfold axis of symmetry, and this meant the space group was probably 1432, $14\bar{3}m$ or $1m3m$. The crystal density at − 25° C. was found to be 1·84 gm./c.c. A unit cell containing 56 P_4 molecules gave a calculated density of 1·82 gm./c.c. The general features of the photographs included, in addition to single crystal spots, weaker diffuse rings corresponding to spacings of roughly 4·3, 2·5 and 1·7 A. Evidence for a high degree of thermal motion in the structure was afforded by the very rapid decrease of the intensities of the diffraction spots after a value of about $\rho = 1{\cdot}0$.

It is reasonable to suppose that the structure is built out of discrete tetrahedra similar to those which exist in the vapour[3], with P — P = 2·21 ± 0·02 A. and angles P/P/P = 60°. Preliminary structural studies with the aid of similar tetrahedral models indicated that 56 P_4 molecules could not be arranged in the unit cell without appreciable mutual overlap, if the non-bonded radius of the phosphorus atom was taken[4] to be 1·9 A. An explanation of the structure may be found in some peculiar effect of the thermal motion on the packing arrangements. Space group $1m3m$ could be rejected as very improbable on general crystallographic grounds, and $14\bar{3}m$ seemed a more likely choice than 1432. Further examination of the crystal structure is proceeding and detailed results will be published elsewhere.

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[1] Joung, H., *Cent. Min. Geol.*, 107 (1926). Thomas, H. A., and Gingrich, N. S., *J. Chem. Phys.*, **6**, 659 (1938). Hultgren, R. S., and Warren, B. E., *J. Chem. Phys.*, **3**, 351 (1935).
[2] Natta, G., and Passerini, L., *Nature*, **125**, 707 (1930).
[3] Maxwell, L. R., and Mosley, V. M., *J. Chem. Phys.*, **3**, 699 (1935).
[4] Pauling, L., "The Nature of the Chemical Bond" (Cornell, 1944).

Thiaadamantane

The investigation into the composition of the sulphur bodies present in the kerosene boiling-range of a Middle East crude oil distillate (Agha Jari, South Iran) has indicated that the sulphuric acid-soluble neutral compounds consist mainly of fully hydrogenated mono- and bi-cyclic sulphides with smaller amounts of alkylated thiophenes. A solid sulphur-containing compound is also present which collects as a sublimate in the column head during the fractionation when the column head reaches 78° C. at 3 mm. mercury pressure. This solid can be purified by sublimation or recrystallization, and forms sweet-smelling crystals which melt in a sealed tube at 320° C. with decomposition. Analysis gives the empirical formula $C_9H_{14}S$.

The general character of this interesting compound together with its chemical reactions, which include the formation of a sulphone and a mercuric chloride complex, suggests that it is a doubly bridged *cyclo*-paraffin in which a sulphur atom forms one bridge. In its physical properties this compound resembles the hydrocarbon adamantane isolated by Landa and Macháček from a Hodonin naphtha[1]. The structure of this hydrocarbon, confirmed by synthesis (Prelog and Seiwerth[2]), is that of a doubly bridged *cyclo*-octane ring (I). Confirmation that our sulphur body contains a basic structure resembling that of adamantane is shown by the fact that, on desulphur-