

## The Structure of the Tris(pentasulphido)platinum(IV) Anion

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CRYSTALS of  $(\text{NH}_4)_2\text{PtS}_{15}\cdot 2\text{H}_2\text{O}$  were prepared for us and the structure problem suggested to us by Professor R. A. Krause of this department. The preparative method used was that of Hofmann and Höchtlen.<sup>1</sup> The crystals are monoclinic with  $a = 15.77$ ,  $b = 9.99$ ,  $c = 13.01$  Å and  $\beta = 93.7^\circ$ . The space group is  $Cc$ , and there are four formula units per unit cell. The structure determination was based on 1340 independent reflections measured visually from equi-inclination Weissenberg photographs taken with Ni-filtered Cu radiation.

The  $x$  and  $z$  co-ordinates for platinum were taken arbitrarily and the  $y$  co-ordinate was found from a Patterson synthesis. The three-dimensional electron density map using phases based on platinum alone was calculated. Since this map was essentially the electron density map of the structure and its centre-related structure, the sulphur atoms were found through structural considerations and the use of successive non-centrosymmetric electron density maps in which the redundant atoms were gradually eliminated. The structure is being refined by Busing, Martin, and Levy's full-matrix least-squares programme. The unweighted reliability index,  $R$ , using anisotropic temperature parameters is 13%. Only one water molecule has

been located; a second may be distributed randomly, but no positive evidence for placing a second water molecule has been obtained from the structure work thus far.

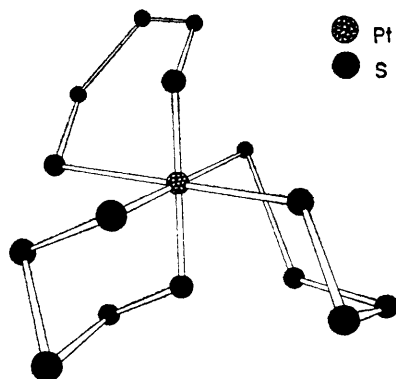


FIGURE. Configuration of  $\text{PtS}_{15}^{2-}$ .

The anion consists of three five-membered sulphur chains co-ordinated to a central platinum atom so as to form, with platinum, three six-membered rings in chair configurations. This is

illustrated in the Figure. The co-ordination environment for platinum is octahedral. At the present time the bond length and angle ranges, average values, and estimated standard deviations of individual values are: Pt-S, 2.28—2.54, 2.43, 0.03 Å; S-S, 1.98—2.15, 2.05, 0.05 Å; S-S-S,

97.8—116.1, 104.8, 5°; Pt-S-S, 103.0—113.0, 109.4, 2.5°; S-Pt-S, 90.5—96.4, 92.8, 2.5°.

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<sup>1</sup> K. A. Hofmann and F. Höchtlen, *Ber.*, 1903, **36**, 3090.