Tin(II) Chloride Complexes of Platinum Metals: the Palladium(II)–Tin(II) System

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THE salts of the platinum metals on interaction with stannous chloride in aqueous or alcoholic solution give coloured products,[1] whose composition has, in recent years, been the subject of much speculation and discussion. Recently, Young *et al.*,[2] determined the structure of a number of the platinum–metal–tin complexes, showing that they were anionic with the following structures $[PtCl_2(SnCl_3)_2]^{2-}$, $[RuCl_2(SnCl_3)_2]^{2-}$, $[Rh_2Cl_2(SnCl_3)_4]^{4-}$ and $[Ir_2Cl_6(SnCl_3)_4]^{4-}$. However, in no investigation has a study of the palladium–tin complex been reported.

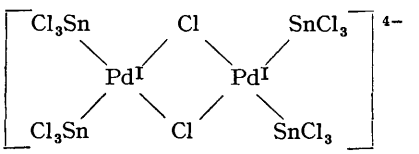
Attempts were made to precipitate the palladium–tin anionic chloro-complex by means of quaternary ammonium salts, *e.g.*, tetraphenylammonium chloride, but all these attempts failed. Using tetraphenylarsonium chloride, however, success was achieved, but only after numerous trial experiments to establish the most favourable conditions.

From a 1 : 1 (v/v) mixture of 2M-HCl and methanol containing palladium and tin in the ratio of 1 : 5, a red precipitate of the complex was obtained on the addition of a two-fold excess of tetraphenylarsonium chloride (2% in methanol). The precipitate was freed from excess of $SnCl_2$ and free acid by repeated washing with methanol. Water or aqueous solution must not be used for washing the precipitate because of the moderate solubility of the latter. The precipitate decomposes above 50°c and, consequently, cannot be dried in the oven: it was dried *in vacuo*.

On the basis of analytical data formula (I) is suggested for the compound

$$[(C_6H_5)_4As]_2, [PdCl(SnCl_3)_2] \quad (I)$$

It is further suggested that the structural formula for this complex might be written as (II).



(II)

This is similar to that suggested for the tin chloro-complex of rhodium,[2] in which a bridged arrangement containing Rh–Sn bonds is supposed to exist.

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[1] L. Wohler, *Chem. Fig.* 1907, **31**, 938, for further references see Shukla, *Ann. Chim.* (*France*) 1961, **13**, (**6**) 1383.
[2] J. F. Young, R. D. Gillard, and G. Wilkinson, *J. Chem. Soc.*, 1964, 992; 5176.