

A Ditertiary Phosphine Complex of Cobalt(0)

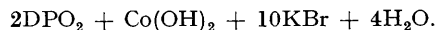
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THE product of the reaction between $[\text{CoBr}_2\{\text{C}_2\text{H}_4(\text{PPh}_2)_2\}_2]$ and sodium borohydride, previously described as a derivative of cobalt(0),¹ was shown to be a hydrido-complex of cobalt(i), $[\text{CoH}\{\text{C}_2\text{H}_4(\text{PPh}_2)_2\}_2]$.²

In order to obtain a well-characterised cobalt(0) derivative, we have investigated the reaction between the above cobalt(ii) complex and several reducing agents. The cobalt(0) complex, $[\text{Co}\{\text{C}_2\text{H}_4(\text{PPh}_2)_2\}_2]$, is best obtained by treating the cobalt(ii) complex with 2M-potassium

hydroxide in aqueous ethanol under nitrogen atmosphere. The reaction takes about 8 days for completion in aqueous solution, and about 3 days in 95% ethanolic solution at room temperature. The reducing agent is in this case the phosphine itself, and the reaction takes place according to the equation $[\text{DP} = \text{C}_2\text{H}_4(\text{PPh}_2)_2]$:



¹ J. Chatt, F. A. Hart, and D. T. Rosevear, *J. Chem. Soc.*, 1961, 5504.

² A. Sacco and R. Ugo, *J. Chem. Soc.*, 1964, 3274.

The red precipitate can be crystallized from benzene, by addition of ethanol, to give paramagnetic dark red crystals, m.p. 227—230°, which are very rapidly oxidised by air. The i.r. spectrum is identical with that of the corresponding nickel(0) complex in the 4000—600 cm^{-1} range. In benzene it has a dipole moment of

1.2 D, assuming $\mu_P = 0$, or 0.0 D, assuming $\mu_P \simeq 0.10 \text{ eP}$.

The cobalt(0) complex in benzene solution quickly reduces hydrogen at room temperature and atmospheric pressure giving the cobalt(II) hydrido-complex,² and at once reduces anhydrous stannous chloride to metallic tin.

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