

Preliminary communication

A new route to hydrido(organosilyl)bis(triphenylphosphine)platinum(II) complexes

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The reactions of silicon hydrides with zerovalent platinum species have been used with limited success for the preparation of compounds containing Pt—Si bonds¹⁻³. We have now found that the complex [Pt(PPh₃)₂C₂H₄] (which is known to be a highly reactive species⁴) provides a convenient starting point for the preparation of a wide range of complexes of the type [PtH(SiY₃)L₂] (L = PPh₃).

Kumada and his colleagues isolated [PtH(SiMeCl₂)L₂] from the reaction between MeCl₂SiH and [PtL₂C₂H₄] in benzene in the presence of 1-hexene, and in the absence of 1-hexene obtained [Pt(SiMeCl₂)₂L₂] from MeCl₂SiH, and [Pt(SiCl₃)₂L₂] from Cl₃SiH, but they could not isolate any Si—Pt complexes from several other silicon hydrides under such conditions². We find that, in the absence of a solvent, treatment of [PtL₂C₂H₄] with an excess of any of the range of organosilicon hydrides listed in Table 1 leads to good yields of [PtH(SiY₃)L₂] complexes, and evolution of a gas which is presumed to be ethylene. The more reactive methylchlorosilicon hydrides, ClMe₂SiH and Cl₂MeSiH, however, give the bis-silyl complexes [Pt(SiClMe₂)L₂] and [Pt(SiMeCl₂)L₂], in agreement with the results obtained in benzene by Kumada *et al.*

TABLE 1

COMPLEXES OBTAINED FROM THE REACTION OF SILICON HYDRIDES WITH [Pt(PPh₃)₂(C₂H₄)]

Silicon hydride	Complex	m.p. (yield) (°C)	$\nu(\text{Pt-H})$ (cm ⁻¹) ^a
Ph ₃ SiH	[PtH(SiPh ₃)(PPh ₃) ₂]	118–120 (46%)	2090 m
Ph ₂ MeSiH	[PtH(SiPh ₂ Me)(PPh ₃) ₂]	122–126 (98%)	2095 m
Ph ₂ SiH ₂	[PtH(SiPh ₂ H)(PPh ₃) ₂]	108–110 (73%)	2075 m, 2055 (sh) ^b
Et ₃ SiH	[PtH(SiEt ₃)(PPh ₃) ₂]	102.5–103.5 (45%)	2105 m
(EtO) ₃ SiH	[PtH{Si(OEt ₃) ₃ }(PPh ₃) ₂]	110–111 (80%)	2090 m
(Me ₂ SiH) ₂ O	[PtH(SiMe ₂ OSiMe ₂ H)(PPh ₃) ₂]	108–110 (81%)	2090 m, 2040 m ^b
(Me ₃ SiO) ₂ MeSiH	[PtH{SiMe(OSiMe ₃) ₂ }(PPh ₃) ₂]	110–112 (72%)	2080 m

^a In Nujol mull. ^b One of the absorptions is attributable to $\nu(\text{Si-H})$.

The hydrido complexes obtained are listed in Table 1. They are cream to off-white crystalline solids, stable in the air. In benzene they decompose slowly, and the failure of Kumada *et al.* to isolate such complexes may have arisen from their use of a solvent². Satisfactory carbon and hydrogen analyses were obtained in all cases. From the NMR spectra of some of the complexes, and from their general resemblance to known complexes¹, we think that all of them probably have a *cis* configuration.

The same complexes are formed, but rather more slowly, from the acetylene complexes $[\text{PtL}_2(\text{PhC}\equiv\text{CX})]$ ($\text{X} = \text{Ph}, \text{H}$). These reactions are also easily reversed (*cf.* ref. 5); e.g. treatment of $[\text{PtH}(\text{SiMePh}_2)\text{L}_2]$ with an excess of phenylacetylene at room temperature gives $[\text{PtL}_2(\text{PhC}\equiv\text{CH})]$.

In additional reactions with other Pt^0 species, we have obtained the yellow bis-silyl species $[\text{Pt}(\text{SiCl}_3)_2(\text{PPh}_2\text{Me})_2]$ (69%), m.p. 168–175°, and $[\text{Pt}(\text{SiCl}_2\text{Me})_2(\text{PPh}_2\text{Me})_2]$ (60%), m.p. 128–130°, by treatment of $[\text{Pt}(\text{PPh}_2\text{Me})_4]$ with Cl_3SiH or MeCl_2SiH at room temperature.

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