A Stable Nickel Hydride Complex: *trans*-Hydridochlorobis(tricyclohexylphosphine)nickel

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SQUARE-PLANAR hydride and alkyl complexes of platinum and palladium are well known, but the nickel analogues appear to be much less thermally stable. For example tri-n-propylphosphinenickel hydride decomposes rapidly in solution at room temperature.[1]

We report the isolation of a stable tertiary phosphine nickel hydride, prepared by treatment of dichlorobis(tricyclohexylphosphine)nickel in tetrahydrofuran–ethanol (4 : 1) with sodium borohydride, at room temperature and under argon. The product was washed with ethanol and water and recrystallised from 30—40° petrol to give yellow-brown crystals *M*(benzene) 646, $[(C_6H_{11})_3P]_2NiHCl$ requires *M* 656. The crystals decompose at 150° under argon. They are stable in air for several hours but solutions are decomposed within minutes. The i.r. spectrum (KBr) shows a sharp band at 1916 cm.$^{-1}$ which may be assigned to the Ni–H stretching frequency. The ^{1}H n.m.r. spectrum in benzene shows a triplet (1 : 2 : 1) at τ 34·6 (J_{P-H} 73·5 Hz.) due to the Ni-hydrogen. These results suggest that the compound is *trans*-hydridochlorobis(tricyclohexylphosphine)nickel.

The nature and magnitude of the electronic and steric effects which stabilise square-planar complexes are of interest.[2] It seems reasonable that the high stability of this nickel hydride relative to other tertiary phosphine nickel alkyl and hydride complexes must largely be due to *steric* effects of the bulky cyclohexylphosphine ligands. These can hinder rearrangement of the square-planar complex to a tetrahedral form and also limit attack of other molecules along the out-of-plane axis.

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[1] M. L. H. Green, C. N. Street, and G. Wilkinson, *Z. Naturforsch.*, 1959, **14b**, 738.

[2] G. R. Davies, R. H. B. Mais, and P. G. Owston, *J. Chem. Soc.* (*A*), 1967, 1750, and references therein.