Some transition metal complexes of a novel diphosphine ligand

Author(s):
Johnson, David

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SOME TRANSITION METAL COMPLEXES OF A
NOVEL DIPHOSPHINE LIGAND

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Presented by
DAVID JOHNSON
B. Sc. Chem. University of Manchester
born February 9, 1947
from Nottingham (England)

Accepted on the recommendation of
Prof. L. M. Venanzi, Referent
Prof. W. Simon, Korreferent

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The design and synthesis are described of a novel sterically-constrained diphosphine ligand, \( \text{2,11-bis(diphenylphosphinomethyl)-benzo}[c]\text{phenanthrene (PCPH}_2 \)\), and the physical and spectroscopic properties of the complexes formed between this ligand and a number of transition metal ions are discussed in terms of the stereochemistry of the complexes.

Nickel(II)halide and pseudohalide complexes \((\text{PCPH}_2\text{NiX}_2)\) are shown to have square planar structures in which the diphosphine spans trans-positions whilst cobalt(I) complexes \([(\text{PCPH}_2)\text{Co(CO)}_3]^+\) and \((\text{PCPH}_2)\text{Co(CO)}_2\text{X (X = halide)}\) are probably 5-coordinate. A bimetallic cobalt(III) complex involving diphosphine bridging is described and a tetrahedral environment about the cobalt atom is established for the complex \((\text{PCPH}_2)\text{CoCl}_2\). Depending upon the particular metal and upon the nature of X, the complexes \((\text{PCPH}_2)\text{MX (M = Cu, Ag, Au)}\) may be either 2-coordinate ionic species or 3-coordinate covalent species and, in some cases, there is evidence for these two structures existing in equilibrium in solution. The 3-coordinate complexes \((\text{PCPH}_2)\text{MCl (M = Cu, Ag)}\) are shown to have distorted trigonal planar structures in the solid state.

It is concluded that the steric properties of the ligand \(\text{PCPH}_2\) show significant deviations from those predicted.