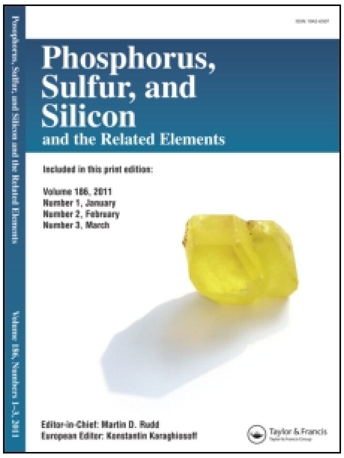


Phosphorus, Sulfur, and Silicon and the Related Elements
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713618290

The Reaction Behavior of White Phosphorus with Metal Complexes of Cobalt and Molybdenum

Manfred Scheer[a]; Uta Becker[a]
[a] Institute of Inorganic Chemistry, University of Karlsruhe, Karlsruhe, Germany

To cite this Article Scheer, Manfred and Becker, Uta(1994) 'The Reaction Behavior of White Phosphorus with Metal Complexes of Cobalt and Molybdenum', Phosphorus, Sulfur, and Silicon and the Related Elements, 93: 1, 391 — 392

To link to this Article: DOI: 10.1080/10426509408021871

URL: http://dx.doi.org/10.1080/10426509408021871

Phosphorus, Sulfur, and Silicon, 1994, Vol. 93–94, pp. 391–392
Reprints available directly from the publisher
Photocopying permitted by license only

THE REACTION BEHAVIOR OF WHITE PHOSPHORUS WITH METAL COMPLEXES OF COBALT AND MOLYBDENUM

MANFRED SCHEER and UTA BECKER
Institute of Inorganic Chemistry, University of Karlsruhe, D-76128 Karlsruhe, Germany

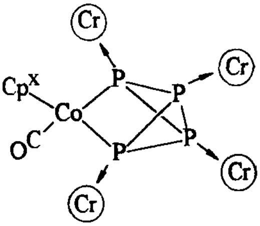
Abstract Studies of the reaction pathway of tetrahedral P_4 with cobalt- and molybdenum coordination compounds lead to novel complexes containing P_x-ligands (x = 2,4) in unusual binding modes.

INTRODUCTION

The reaction of white phosphorus with coordination compounds has been studied extensively.[1] However, little attention has been paid to the investigation of the reaction pathways of the tetrahedral P_4 to the corresponding P_x-ligands.

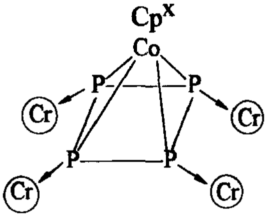
RESULTS AND DISCUSSION

The three-component reaction of $[Cp^xCo(CO)_2]$ (Cp^x = Cp, Cp', Cp", Cp'"; Cp' = $\eta^5\text{-}C_5H_4t\text{Bu}$, Cp" = $\eta^5\text{-}C_5H_3t\text{Bu}_2$, Cp'" = $\eta^5\text{-}C_5H_2t\text{Bu}_3$) with P_4 in the presence of $[Cr(CO)_5THF]$ under UV conditions provides an explanation of the reaction pathway in the case of complexes forming fragments with an even number of valence electrons. The reaction proceeds via a bicyclotetraphosphine derivative 1 to give the cyclotetraphosphine complexes 2 and 3 as the final products.[2]



Cp^x = Cp, Cp', Cp", Cp'"

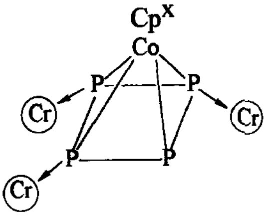
1



Ⓒr = $Cr(CO)_5$

Cp^x = Cp, Cp'

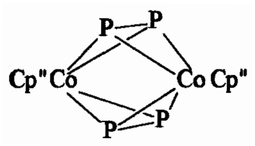
2



Cp^x = Cp", Cp'"

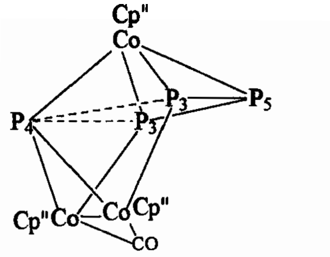
3

The comparison of the reaction described above with the analogous photochemical two component reaction of P_4 with [Cp"Co(CO)$_2$] affords besides [Cp"Co(μ, η^2-P_2)]$_2$ (4)[3] the major product [(Cp"Co)$_3$(P_4)(CO)] (5).[4] 5 shows a new type of a kite-like distorted planar P_4 ligand capped by a Cp"Co moiety. A [(Cp"Co)$_2$(CO)] dimer coordinates to three of the phosphorus atoms. The most remarkable feature of the structure is the long P-P distance between P(3) and P(4) of 2.503 Å, which can be considered as a borderline case between a still bonding P-P bond and a Van der Waals contact.

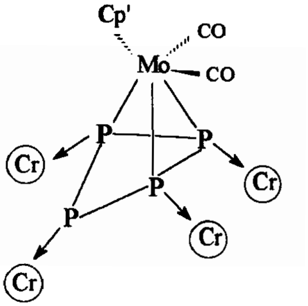


Cp" = η^5-$C_5H_3tBu_2$

4



5



Ⓒr = Cr(CO)$_5$

6

[Cp^{x}Mo(CO)$_2$]$_2$ (Cp^x = Cp', Cp"), which forms fragments with an odd number of valence electrons, reacts with P_4 in the presence of [Cr(CO)$_5$THF] under photochemical conditions to give at least three different P_x ligand containing products.[5] 6 is one of the products. In 6 the [Cp^{x}Mo(CO)] fragment binds to three P-atoms of the non planar P_4 ring. The P(4)-atom lies out of the plane of the other P-atoms. 5 as well as 6 could be intermediates in the reaction to P_1-and P_3-ligand complexes.

ACKNOWLEDGMENT The authors thank the Deutsche Forschungsgemeinschaft and the Fonds der Chemischen Industrie for financial support.

REFERENCES

1. M. Scheer and E. Herrmann, Z. Chem., 30, 41 (1990); O. J. Scherer, Angew. Chem. Int. Ed. Engl., 29, 1104 (1990).
2. M. Scheer, U. Becker, J.C. Huffman and M.H. Chisholm, J. Organomet. Chem., 461, C1 (1993).
3. M. E. Barr and L. F. Dahl, Organometallics, 10, 3991 (1991).
4. M. Scheer, U. Becker, M. H. Chisholm, J. C. Huffman, F. Lemoigno and O. Eisenstein, Inorg. Chem., submitted.
5. M. Scheer, U. Becker and J. Magul, publication in progress.