

## Preliminary communication

### Reversible addition of molecular hydrogen and conjugated dienes to $\text{Co}^{\text{I}}$ complexes with 2,2'-bipyridine and 1,10-phenanthroline

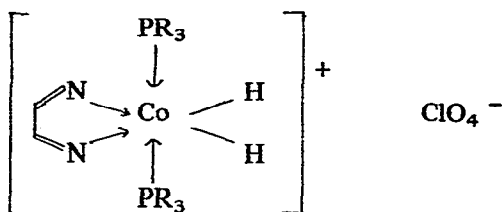
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In a previous paper<sup>1</sup> we reported the synthesis of stable  $\sigma$ -alkyl and  $\pi$ -allyl derivatives of  $\text{Co}^{\text{III}}$  with 2,2'-bipyridine (Bipy) and 1,10-phenanthroline (Phen) and suggested the existence of unstable hydridic cobalt compounds. We now report the synthesis and reactivity of series of new hydride complexes of  $\text{Co}^{\text{III}}$  and diene complexes of  $\text{Co}^{\text{I}}$  with Bipy and Phen, stabilized by tertiary phosphines.

When  $\text{Co}^{\text{I}}$  derivatives such as  $[\text{Co}(\text{Chel})_3]^+ \text{ClO}_4^-$  ( $\text{Chel} = \text{Bipy}$  or  $\text{Phen}$ )<sup>2</sup> are treated with molecular hydrogen in the presence of  $\text{PR}_3$  at room temperature and atmospheric pressure, crystalline yellow-orange compounds of suggested structure (I) can be isolated.



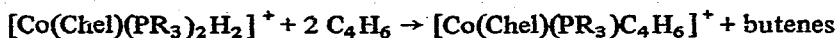
( $\text{PR}_3 = \text{triethyl-}, \text{tri-}n\text{-propyl-}, \text{tri-}n\text{-butyl-}$  and  $\text{diethylphenyl-phosphine}$ )

Elemental analysis and magnetic measurements are in agreement with the assigned formulae. NMR confirms the presence of two equivalent atoms of hydrogen ( $\tau$  32.4,  $J(\text{HP})$  65 cps). Models favour the *trans* position of the phosphines.

The reported reactions are reversible; in fact, with an excess of chelating ligand, molecular hydrogen is evolved and  $[\text{Co}(\text{Chel})_3] \text{ClO}_4$  is reformed.

In the presence of  $\text{PR}_3$  and under similar conditions,  $[\text{Co}(\text{Chel})_3]^+$  complexes also react with butadiene and isoprene, giving deep red crystalline complexes  $[\text{Co}(\text{Chel})(\text{PR}_3)\text{diene}] \text{ClO}_4$  (II). These reactions are reversible in the presence of an excess of Bipy or Phen. Even in excess of  $\text{PR}_3$  in atmosphere of hydrogen the  $\pi$ -bonded diene is displaced and (I) is formed.

The inverse reaction I  $\rightarrow$  II can also be brought about by treating (I) with butadiene in excess, according to the following scheme:



Complexes (I) can therefore be considered as potential catalysts for the hydrogenation of conjugated dienes to alkenes

#### ACKNOWLEDGEMENTS

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#### REFERENCES

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