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Organic Chemistry: Current Research

Short Communication

Short Communication on Organometallic Compounds

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ABSTRACT

Organometallic Compounds in simpler terms are defined as compounds with metal-carbon bonds. Example: CH3MgBr, Ph-Li, [Ni(CO)4], Ferrocene etc.

The compounds possess covalent bonds between metal and carbon atoms. In general, compounds having a metal - ligand bond of considerable covalent character have similar chemical behaviour. For more clear understanding metal-cyano complexes are not considered as organometallic compounds while metal carbonyl complexes are.

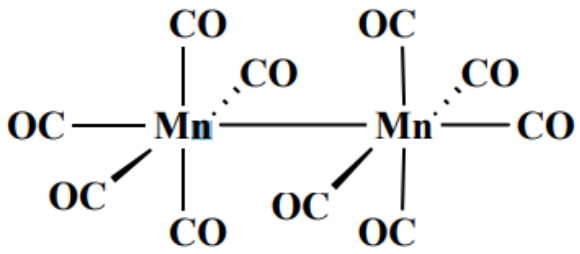
Keywords: Organometallic compounds; 18-electron rule

INTRODUCTION

Organometallic compounds use is mostly found in both stoichiometrically in research and industrial chemical reactions, in addition to this in the role of catalysts to increase the rates of reactions (e.g., as in uses of homogeneous catalysis), where target molecules include polymers, pharmaceuticals [1].

18-electron Rule

18-electron rule is satisfied by the metal-metal bonds possessing odd number of electrons in their carbonyl complexes.



The carbonyl groups share one electron each from two metals and forms a bridge between them.

Oxidative Addition

A reaction in which metal adds on a neutral ligand during which it oxidizes the metal, typically by 2e-. Two anionic ligands are formed by transferring of the two electrons from the metal to the incoming ligand by breaking a bond in that ligand. At least one of these new anionic ligands ends up bonded to the metal centre.

$MLn + X\text{-}Y \rightarrow X{-}M(Ln){-}Y$

Reductive elimination

A reaction in which two cisoidal anionic ligands on a metal centre couple together. Each anionic ligand pushes one electron back onto the metal center to reduce it by 2e-. The coupled anionic ligands then usually fall off the metal centre as a neutral molecule.

$X{-}M(Ln){-}Y \rightarrow MLn + X\text{-}Y$

Electrophilic

Such molecules do contain electro-negative atoms and are good oxidizing agents. They are often considered to be "reactive" substrates. These molecules do not require the presence of an empty orbital (18e- is OK) on the metal centre in order to perform the oxidative addition reaction. Examples: X_2 (X = Cl, Br, I), R-X, Ar-X, H-X, O_2

Concepts & techniques

As in other areas of chemistry, electron counting is useful for organizing organometallic chemistry. The 18-electron rule is helpful in predicting the stabilities of metal carbonyls and related compounds. Most organometallic compounds do not however follow the 18e- rule. Chemical bonding and reactivity in

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organometallic compounds is often discussed from the perspective of the isolobal principle.

CONCLUSION

As well as X-ray diffraction, NMR and infrared spectroscopy are common techniques used to determine structure. The dynamic properties of organometallic compounds are often probed with variable-temperature NMR and chemical kinetics.

REFERENCES

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