

**P.G. SEMESTER-IV**

**ELECTIVE COURSE-1a**

**INORGANIC CHEMISTRY SPECIAL**

**UNIT-I[A]: ALKYL AND ARYL TRANSITION  
METALS**

**TOPIC- TYPES OF ALKYL AND ARYL  
TRANSITION METALS**

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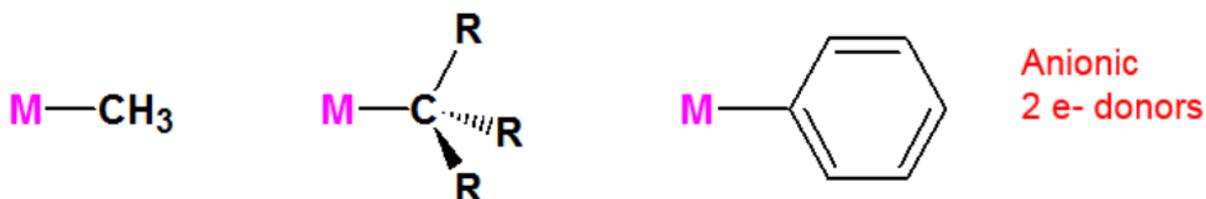
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## METAL ALKYL AND ARYL COMPLEXES

Compounds of metal with alkyl radical are called metal alkyls while those with aryl are called metal aryls. It contains direct M-C bond.



Where C comes from alkyl or aryl radical and it acts as ligand. It may be generally sigma donor. It may be

- homoleptic (if ligands are same) or
- heteroleptic (if ligands are different)

It may be -

- symmetrical (when ligands are same) or
- asymmetrical (when ligands are different)

Similarly it may be –

- mono nuclear or
- poly nuclear.

## Homoleptic Complexes

In these complexes, the metal ion is bonded to identical donor groups. In these complexes, the metal ion is bonded to identical donor groups.

Examples-

$[Ni(CO)_4]$  (Tetracarbonylnickel(0)): A famous organometallic complex used in the Mond process to purify nickel. All four ligands are carbon monoxide.

$[Cu(CN)_4]^{3-}$  (Tetracyanocuprate(I) ion): Here, copper is bonded exclusively to four cyanide ions.

$[Fe(H_2O)_6]^{3+}$  (Hexaaquairon(III) ion): This is the common form of iron(III) in acidic aqueous solutions, where it is surrounded by six water molecules.

$[Al(OH)_4]^-$  (Tetrahydroxoaluminate ion): Formed when aluminum amphotERICALLY dissolves in a strong base; it contains only hydroxide ligands.

$[Ag(NH_3)_2]^+$  (Diamminesilver(I) ion): The active component in Tollen's Reagent, featuring two ammonia molecules.

### Homoleptic Complex Ion



only one type  
of ligand

### Heteroleptic Complex Ion



two types  
of ligand

## Heteroleptic Complexes

In these complexes, the central metal is bound to more than one type of ligand.

### Examples-

These complexes are often more chemically reactive or biologically active because the different ligands create "chemical asymmetry."

- $[Cr(NH_3)_4Cl_2]^+$  (**Tetraamminedichlorochromium(III) ion**): Contains four ammonia molecules and two chloride ions.
- $[Rh(PPh_3)_3Cl]$  (**Wilkinson's Catalyst**): A major industrial catalyst for hydrogenation. It contains three triphenylphosphine ( $PPh_3$ ) groups and one chloride ( $Cl$ ) atom.
- $[Fe(CN)_5(NO)]^{2-}$  (**Sodium Nitroprusside**): Used medically to lower blood pressure. It has five cyanide ligands and one nitrosyl ( $NO$ ) ligand.
- $[Pt(NH_3)_2(C_2O_4)]$  (**Oxaliplatin**): A chemotherapy medication. It features two ammonia molecules and one bidentate oxalate ( $C_2O_4^{2-}$ ) ligand.
- $[Co(en)_2Cl_2]^+$  (**Dichlorobis(ethylenediamine)cobalt(III)**): Contains two ethylenediamine ( $en$ ) bidentate ligands and two chloride ions.

.....TO BE CONTINUED