PROF. DR. SELEN BİLGE KOÇAK

CHM0308 INORGANIC CHEMISTRY II

18 ELECTRON RULE [EFFECTIVE ATOMIC NUMBER (EAN) RULE]

OLEFIN COMPLEXES

The olefins, such as ethylene, butadiene, may replace with CO in the carbonyl complexes.

Fe (co)₂ (C4H₆) = 26+3×2+4=36

Mn (co)₄ (C₂H₇) = 25+4×2+3=36

Nf (No) (C7H₅) = 28+3+5=36

Fe (co)₅ + C₂H₄
$$\longrightarrow$$
 Fe (co)₄ C₂H₄ + co (T)

+ 2C₂H₄ \longrightarrow Fe (co)₂ (C₂H₄)₂+2co (T)

+ 3C₂H₄ \longrightarrow Fe (co)₂ (C₂H₄)₂+3co (T)

+ 5C₂H₄ \longrightarrow Fe (co)₂ (C₁H₄)₂+3co (T)

+ 5C₂H₄ \longrightarrow Fe (co)₂ (C₁H₄)₂+3co (V)

Where constant the contraction of
 $[M(CO)6] + olefin \rightarrow [M(CO)_x olefin]$ (reflux)

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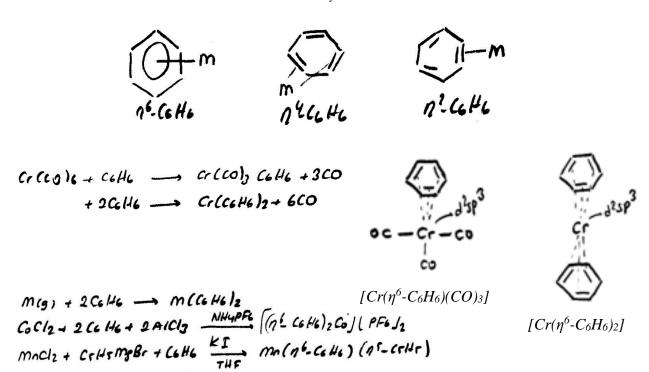
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ALKYNE COMPLEXES

The behavior of alkynes as a ligand is similar to that of the alkenes.

ARENE COMPLEXES

Benzene can bind to transition metals in three ways:

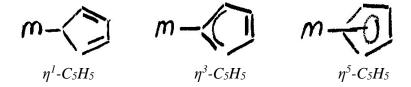


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CYCLOPENTADIENYL COMPLEXES

Cyclopentadienyl (Cp, C₅H₅) ligand can bind to the metal atom in three ways: From one carbon (η^1 -), three carbons (η^3 -) and five carbons (η^5 -).



The first complex synthesized with the cyclopentadienyl ligand is ferrocene [Fe(η^5 -C₅H₅)₂]. The most stable metallocene is ferrocene. All metallocenes except ferrocene are paramagnetic.

Ferrocene [$Fe(\eta^5-C_5H_5)_2$]

Fe:26e-

 $Fe^{0}:26e^{-}$

 $26+5x2=36e^{-}(Kr)$

Fe:8e-

 $Fe^{0}:8e^{-}$

 $8+5x2=18e^{-1}$



Cobaltosene [$Co(\eta^5-C_5H_5)_2$]

Co:27e-

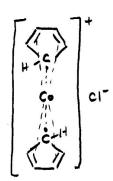
 $Co^{0}:27e^{-}$

 $27+5x2=37e^{-1}$

Co:9e-

 $Co^{0}:9e^{-}$

 $9+5x2=19e^{-}$



Because it has $19e^-$, it is not stable and easily oxidized to form $[Fe(\eta^5-C_5H_5)_2]^+$.