Polynuclear Carbonyl Clusters (CC)

① LNCC

Lower Nuclear CC

(1) No. of metal ≤ 4.

(2) $Mn_2(CO)_{10}$, $Fe_2(CO)_9$, etc

(3) LNCC follow 18 $e^{\ominus}$ rule

M – M bond = $\frac{18n - TVE}{2}$

② HNCC

Higher nuclear C.s

(1) No of metal is greater than ④.

(2) Ex: $Rh_6(CO)_{11}$, $[Fe_5(CO)_5]$

(3) HNCC do not follow 18 $e^{\ominus}$ rule

(4) M–M bond is not so important.

Structure → skeletal $e^{\ominus}$ pair.

$S = \frac{TVE - 18n}{2}$

① $Mn_2(CO)_{10}$

TVE = 7×2 + 20 = 34

M-M : $\frac{36-34}{2}$ = ①

② $Fe_2(CO)_9$

TVE = 16 + 18 = 34

MM = $\frac{36-34}{2}$: ②

③ $Fe_3(CO)_{12}$

TVE = 8×3 + 24

= 48

M-M = $\frac{48-18n}{2}$

= $\frac{48-54}{2}$ = $\frac{6}{2}$ = ③

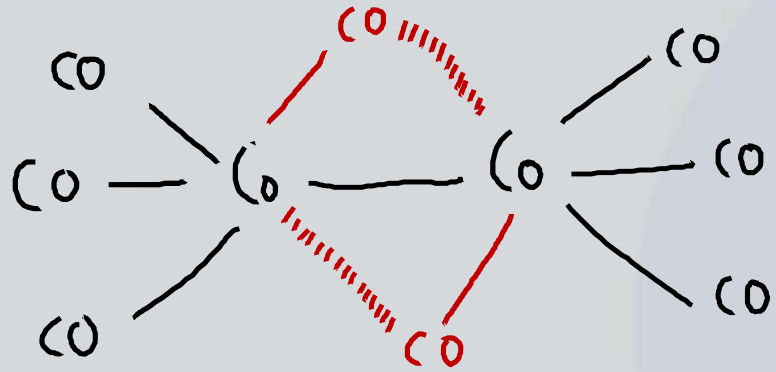
Carbonyl Complex

① If distance bet^n two metal ↑ Bridging formation ability ↓

② n↑ If size of metal ↑ Bridging formatn ability ↓

$Co(CO)_4 \longrightarrow Co_2(CO)_8$

Paramagnetic

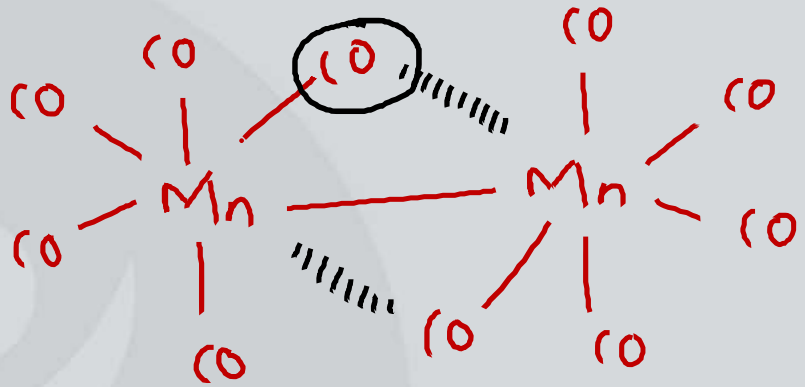


C.N = 6

Size Mn > Co

$Mn(CO)_5 \longrightarrow Mn_2(CO)_{10}$

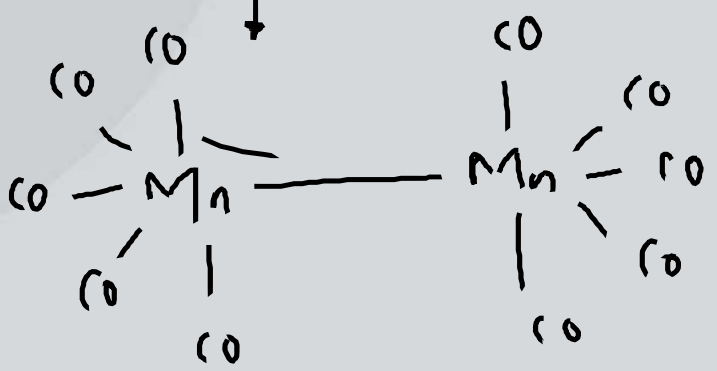
Para



C.N = 7

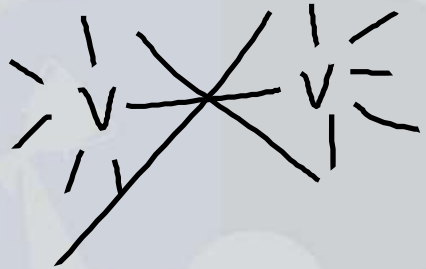
Bridging Ability ↓

Mn size large ↑



③ $[V(CO)_6]$ ⟶ $V_2(CO)_{12}$ n/o dimerization because saturated compound.

Paramag



V → size very large

Bridging ability ↓

3	4	5	6	7	8	9	10
Sc	Ti	V	Cr	Mn	Fe	Co	Ni
				Tc	Ru	Rh	Pd
				Re	Os	Ir	Pt

Always exists in monomeric form. (for carbonyls)

Poly nuclear

∴ No form carbonyl Bridging

Bridging possible form polynuclear complexes.

∴ C.N. = 6