

# CO BINDING

Migratory insertion involves the transfer of a hydride or alkyl group from a metal to a bound carbon monoxide. Because this reaction specifically involves bound carbon monoxide, we should take a look at how CO binds to transition metals. We should begin by reviewing the Lewis structure of carbon monoxide.



**Figure MI2.1.** The Lewis structure of carbon monoxide.

Note the lone pair on carbon monoxide. It is a potential Lewis base or nucleophile. For a number of reasons, transition metals are almost always electrophiles: they are often positively charged ions, but in general they have an 18-electron octet that is difficult to fill, so they frequently need more electrons.

- Lewis: CO is a two electron donor
- Transition metals are electrophiles
- CO binds to metal atoms or ions
- The carbon is the usual donor atom; it has a lone pair and a negative formal charge

The donation of an electron pair to a metal cation is shown in figure MI2.2.



**Figure MI2.2.** Binding of CO to a metal cation.

Remember, because the 18-electron rule for transition metals makes them electrophilic, the electron pair does not need a positive charge to attract it (figure MI2.3).



**Figure MI2.3.** CO binding to a neutral metal atom.

Frequently, the formal charges and lone pairs are not even shown in the transition metal compound, because of the complexity of the picture.



**Figure MI2.4.** A more commonly used picture of CO binding leaves out the formal charges.

Note that CO in the context of metal complexes is often referred to as carbonyl. For example,  $\text{Cr}(\text{CO})_6$  is called hexacarbonyl chromium.

Source : <http://employees.csbsju.edu/cschaller/Reactivity/insertion/insertion%20binding.htm>