

# CONCERTED OXIDATIVE ADDITION

Concerted oxidative addition is a more general reaction than polar addition, in the sense that it is not restricted to compounds that can undergo aliphatic nucleophilic substitution. It could also be thought of as non-polar oxidative addition, because it does not involve charged intermediates as seen in the polar mechanism.

Aryl halides, for example, do not undergo nucleophilic substitution, but they do undergo concerted oxidative addition.

Instead of proceeding step by step, the addition of both fragments is synchronized. They add to the metal at the same time.

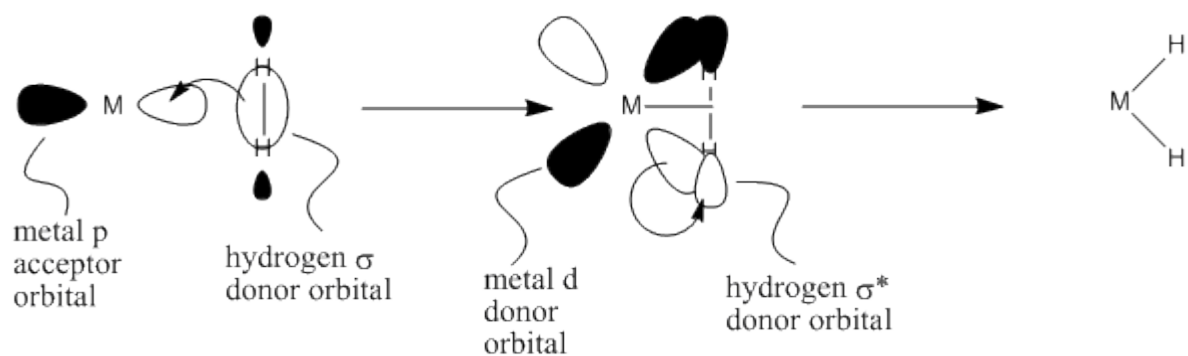


**Figure OA4.1.**

At first, it's difficult to understand this mechanism in terms of nucleophiles and electrophiles. The reaction is generally explained in terms of molecular orbital interactions, however, that can be thought of as nucleophile-electrophile interactions.

There are interactions involved in a concerted or non-polar oxidative addition.

- There is sigma bond donation from a bonding orbital in the substrate into a metal p orbital. This interaction is shown on the left of figure OA4.2.
- There is donation from a metal d orbital into an antibonding orbital on the substrate. This interaction is shown in the middle of figure OA4.2.
- Overall, a pair of electrons are donated from the substrate to the metal, and a pair of electrons are donated from the metal to the substrate.



**Figure OA4.2. Molecular orbital interactions in a non-polar oxidative addition.**



**Figure OA4.3. A curved arrow representation of non-polar oxidative addition.**

Source: <http://employees.csbsju.edu/cschaller/Reactivity/oxadd/oxaddnonpolar.htm>