Day 3: Organotransition Metal Complexes: History, Structure, and Bonding II

TODAY'S TOPICS

- periodic trends
- HSAB theory
- VSEPR theory
- crystal field theory
- ligand field theory
- metal–ligand bonding

CHEMIST OF THE DAY

name?
known for?

QUOTE OF THE DAY

"Persistence in scientific research leads to what I call instinct for truth."

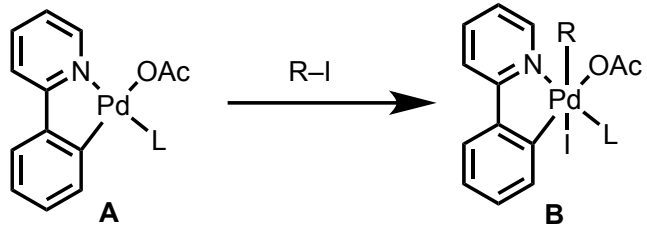
- Louis Pasteur

READING

Hartwig: Ch. 1.3–2.2
Crabtree: Ch. 1.5–1.11

PROBLEMS OF THE DAY

#1 Cyclometallated palladium species **A** rapidly undergoes oxidative addition with organohalides to give **B**.



A **B**

A. For both complexes, **provide the (a) coordination number, (b) d-electron count, (c) geometry, (d) metal oxidation state, and (e) total electron count**.

B. For both complexes, **provide the d-orbital diagrams predicted from CFT.**

C. Baed on steric and stereoelectronic considerations, **predict which d-orbital of A would be most likely to particpate in the reaction.**

#2 **Predict wheter the following complexes are high or low spin:** (a) $[Co(H_2O)_6]^{3+}$, (b) $[Ni(CN)_4]^{2-}$, (c) $[CoF_6]^{3-}$

#3 Using MO theory, **provide general energy diagrams describing ligand–metal bonding for the following:** (a) an L-type, (b) an X-type, and (c) a Z-type ligand.

#4 For the series $[Mn(CO)_6]^{+}$, $[Cr(CO)_6]$ and $[V(CO)_6]^{-1}$, **order the complexes by increasing CO stretching frequency.**