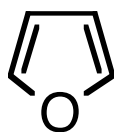


FURAN

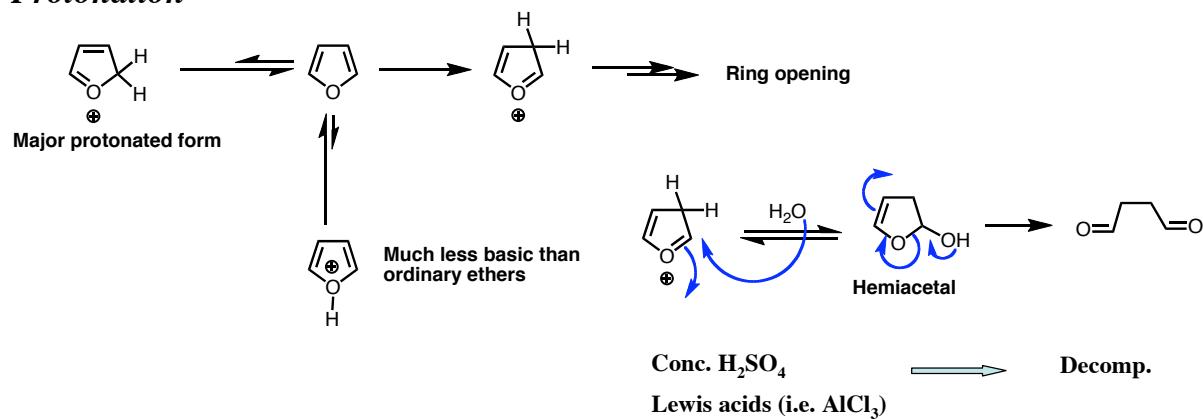


The least aromatic 5-membered ring

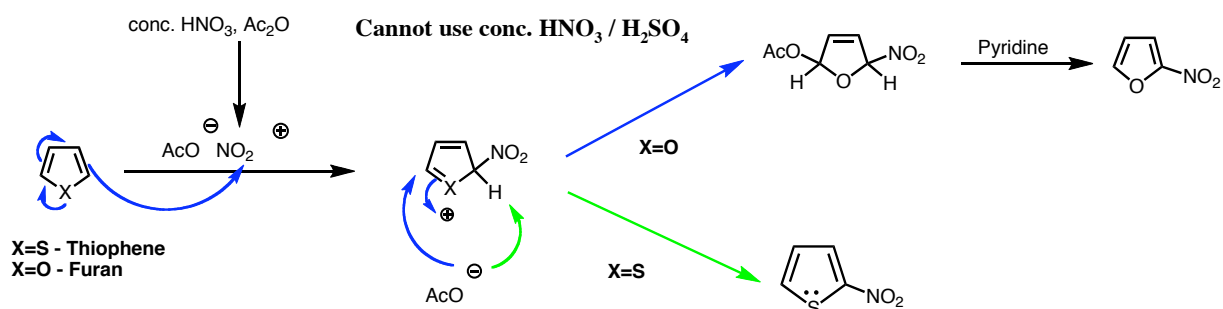


Reaction with electrophiles

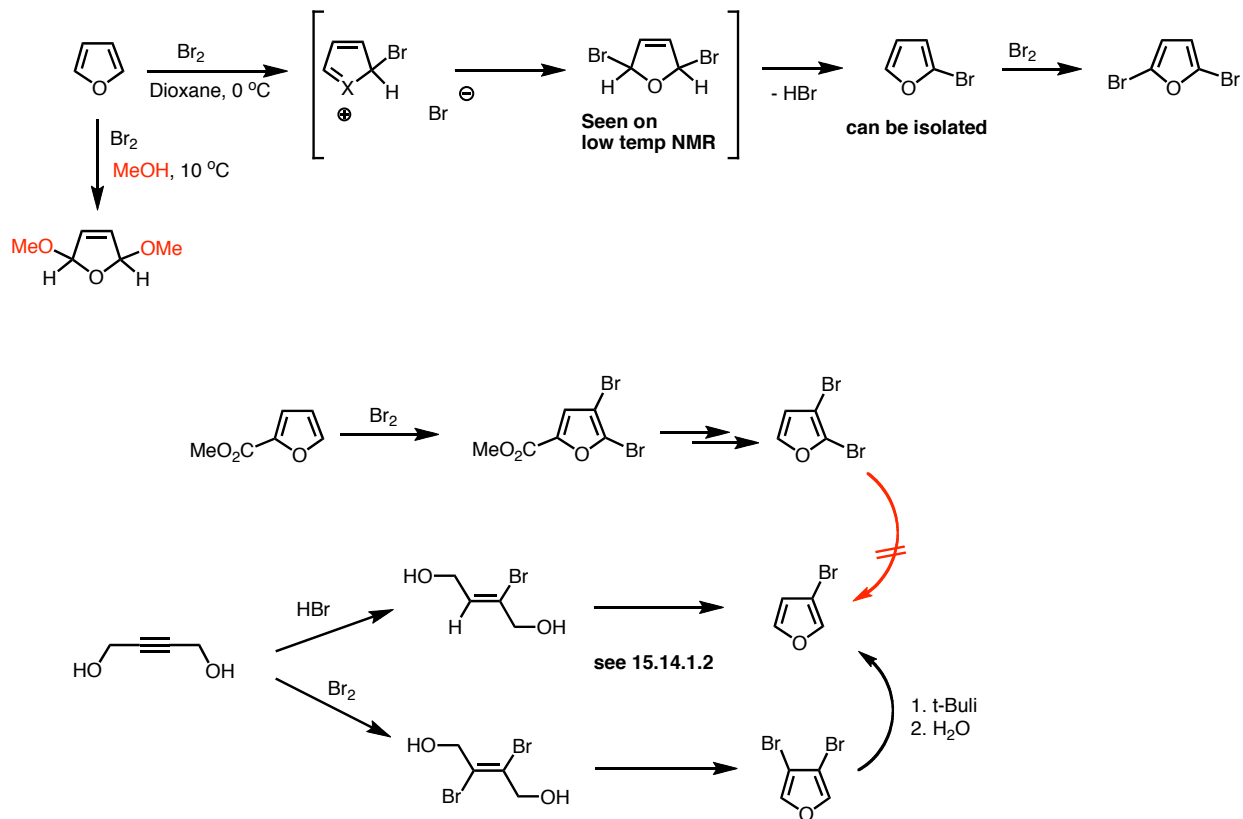
Protonation



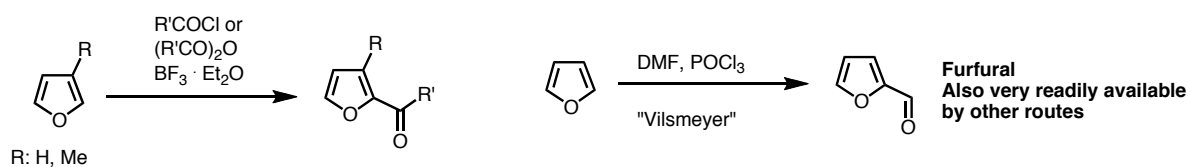
Nitration



Halogenation

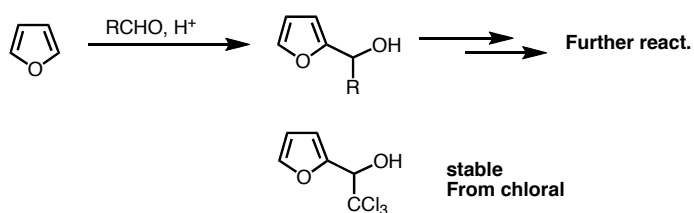


Acylation

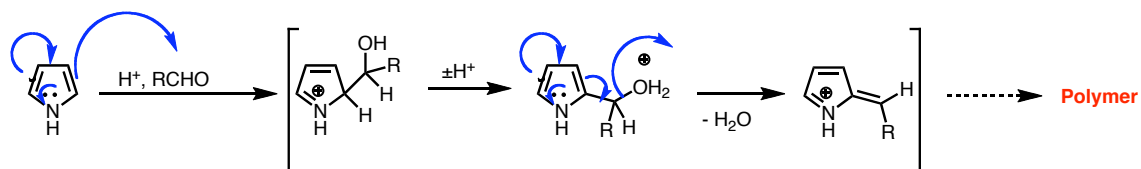


Alkylation Generally not practical (polyalkylation, polymerisation)

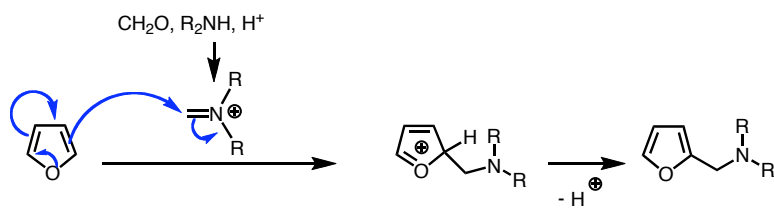
Condensation with Aldehydes and Ketones



C.f.

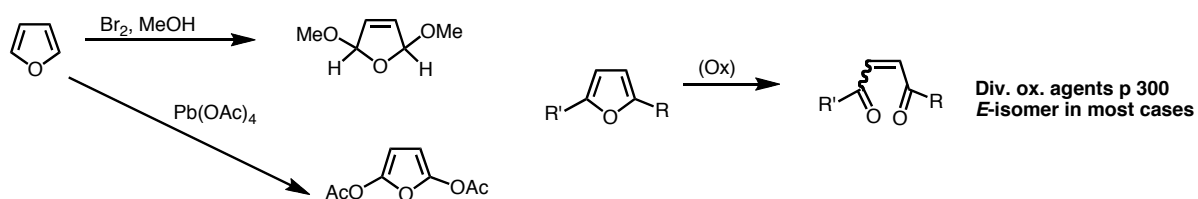


Condensation with imines / iminium ions (Mannich)



Unsubst furan: iminium ion must be preformed

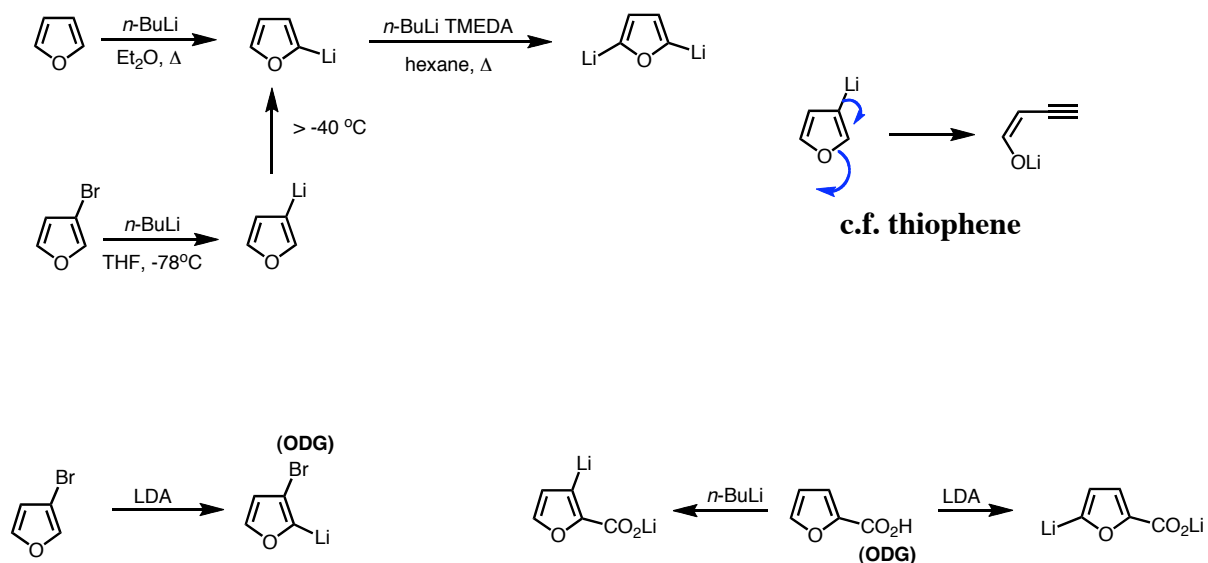
Reaction with oxidating agents



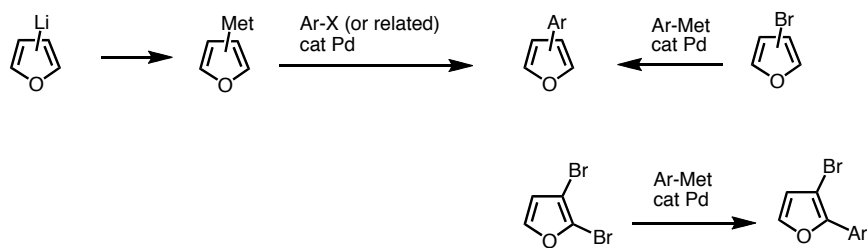
Reaction with nucleophiles

Some ex. on furans activated with $-\text{NO}_2$ group

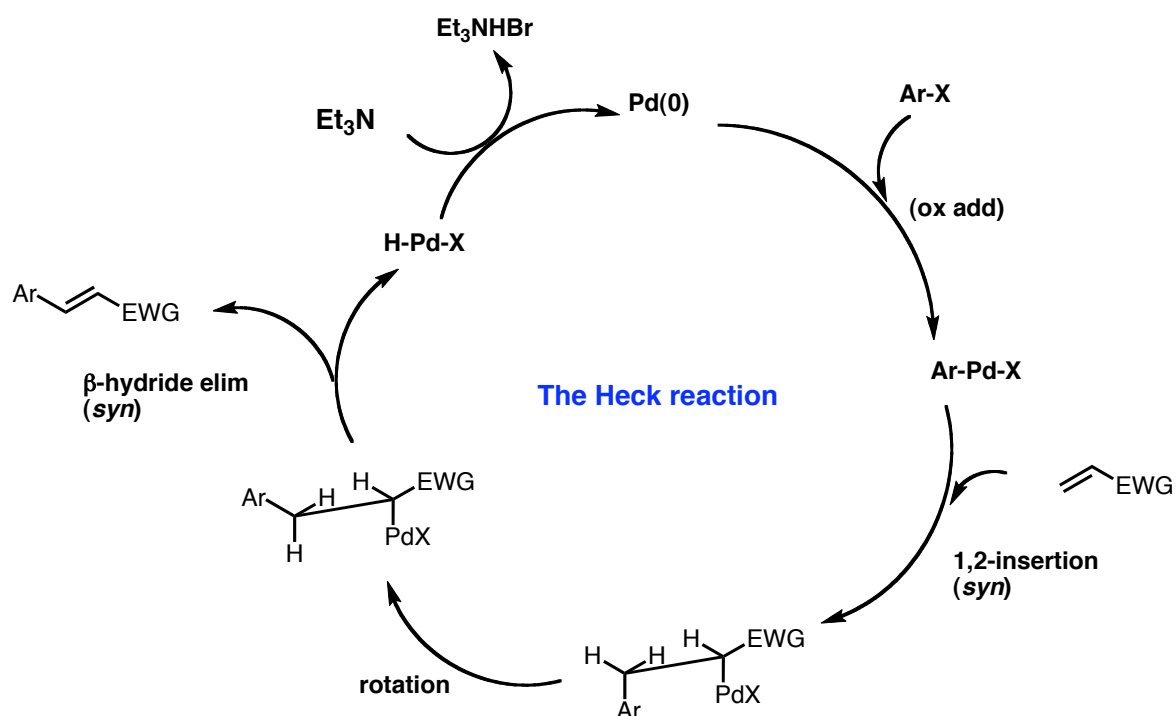
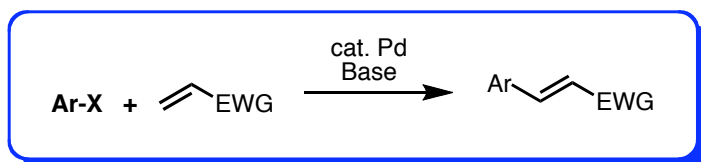
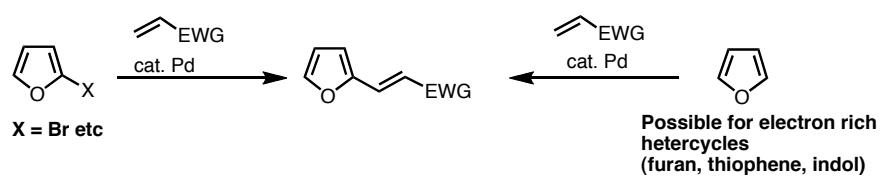
Metallation and further react.

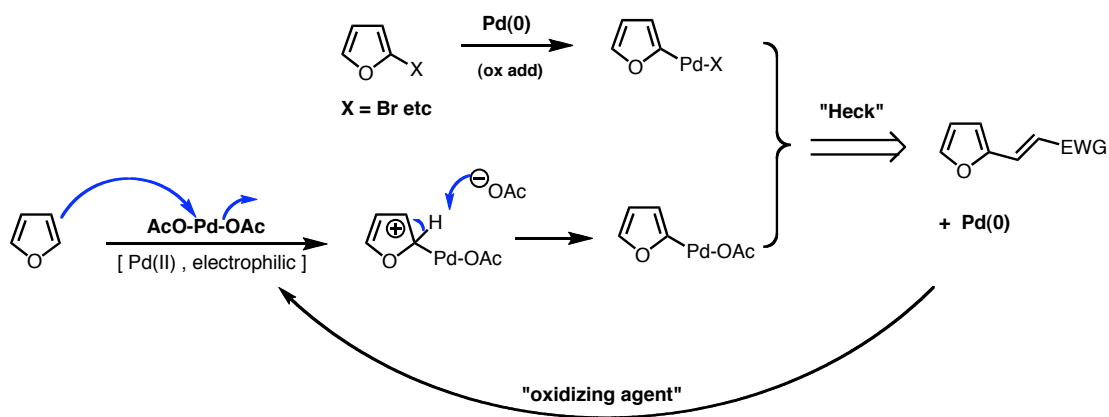


Pd-cat couplings

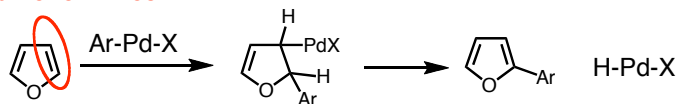


Heck related reactions





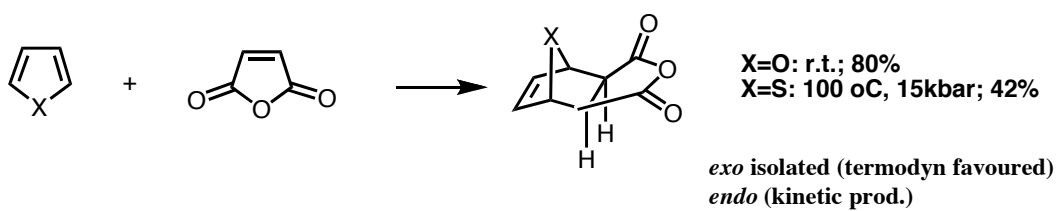
like an alkene in Heck



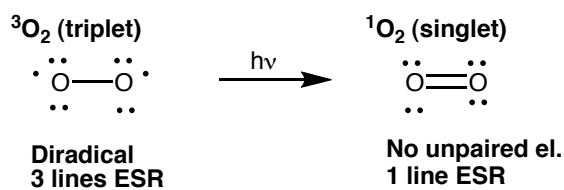
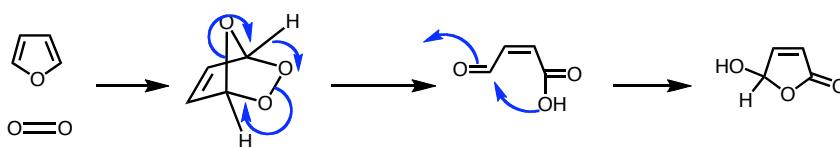
Cycloadditions

Furanes as diene - one of the first DA examples

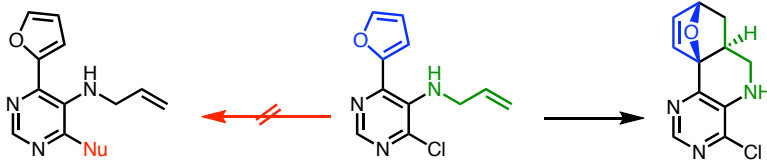
Furan reacts with many dienophiles (alkenes, alkynes, allenes)



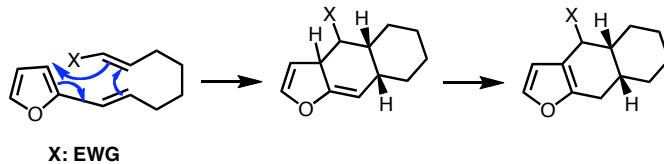
With $^1\text{O}_2$



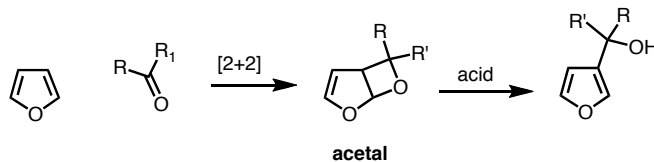
IMDAF: Intramolecular Diels Alder react. on furan



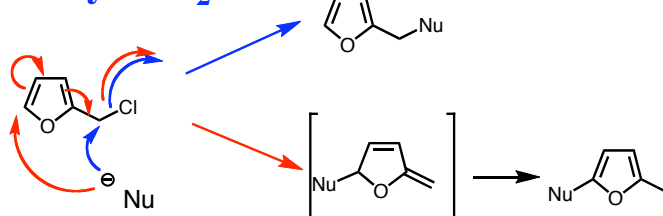
Furan as dienophile (only intramolec. ex)



Photochemical cycloaddition



Furyl-CH₂-X



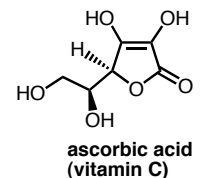
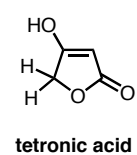
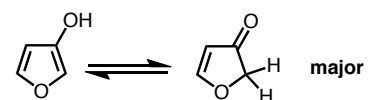
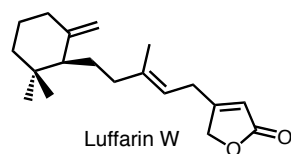
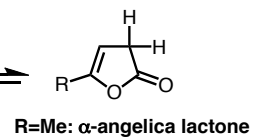
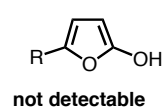
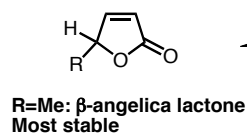
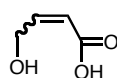
Aminofurans

- Aminoform
- Unstable

Oxyfurans

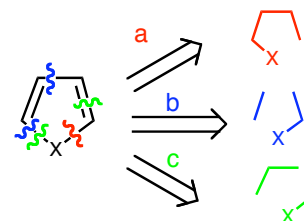
Butenolides (natural prod.)

named as der. of

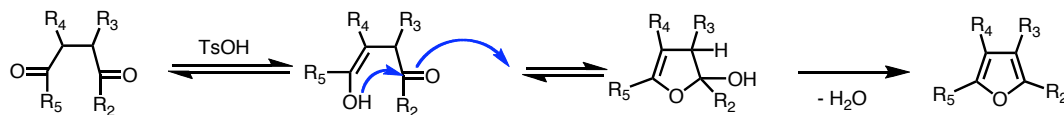


Synthesis of Furans

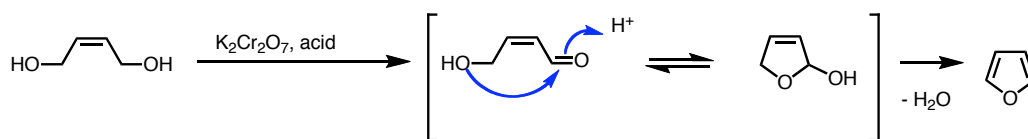
Carbonyl condensations



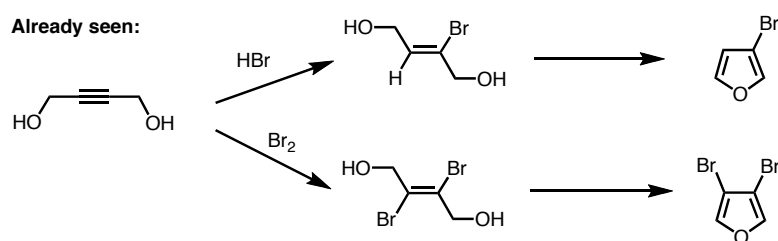
Paal Knorr (1,4-dicarbonyl) (Strategy a)



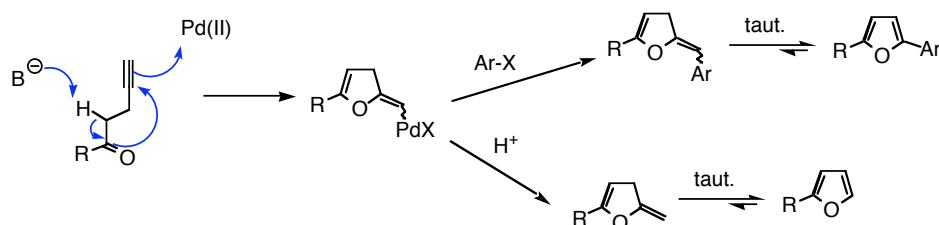
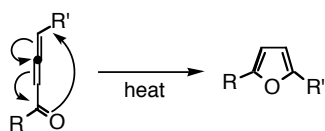
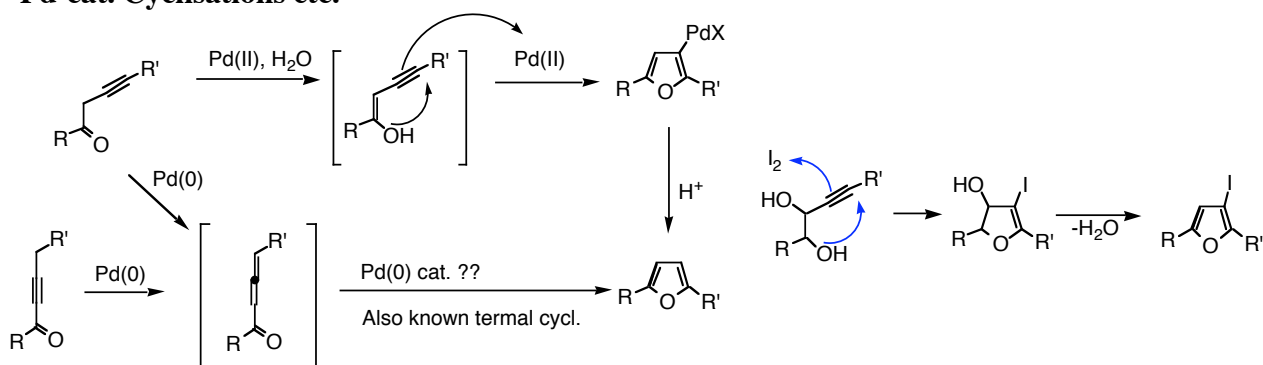
Related:



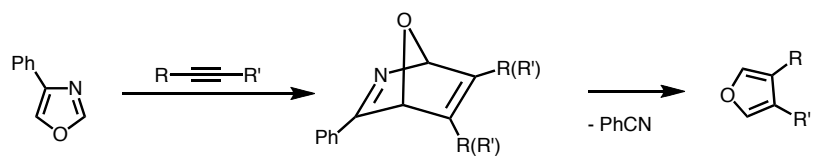
Already seen:



Pd-cat. Cyclisations etc.



Cycloadditions



R / R': i.e. $-\text{SnBu}_3$, $-\text{SiMe}_3$, alkyls etc.

c.f.

