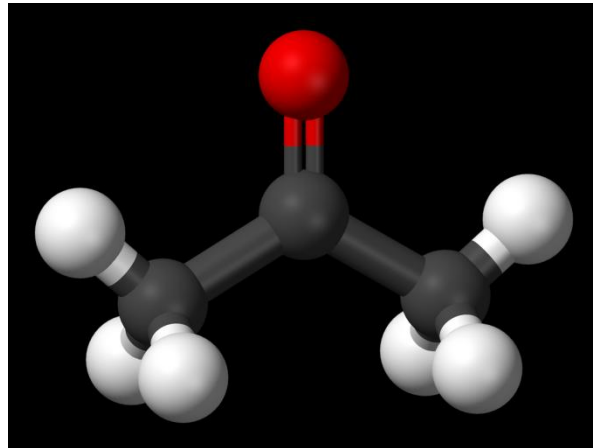
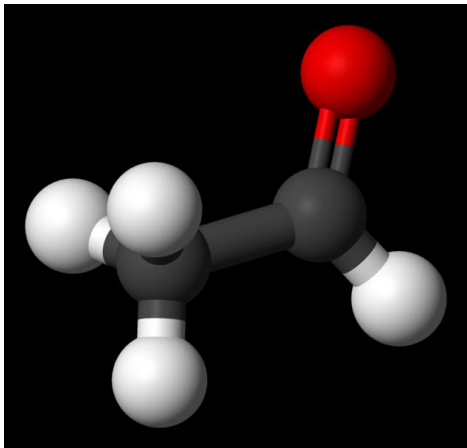
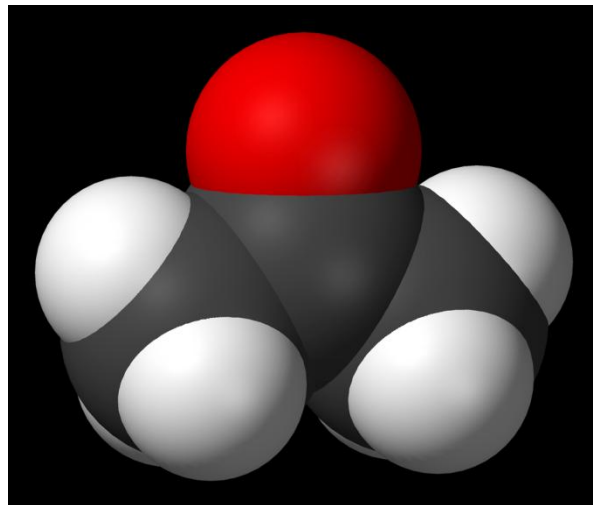
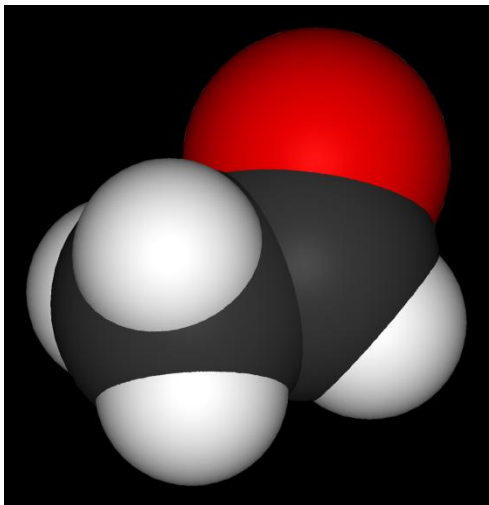
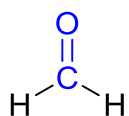


Aldehydy a ketony

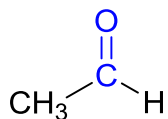


Názvosloví aldehydů a ketonů

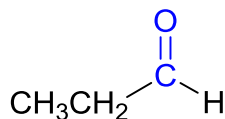
Podle pravidel IUPAC je přítomnost aldehydové skupiny vyjádřena příponou *-al*.



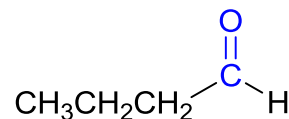
methanal
formaldehyd



ethanal
acetaldehyd

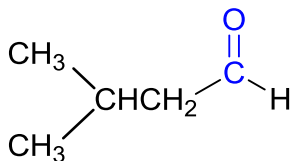


propanal
propionaldehyd

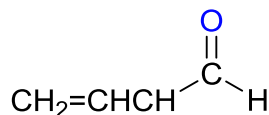


butanal
n-butyraldehyd

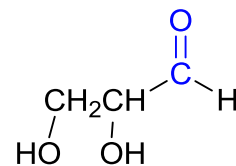
V případě substituovaných aldehydů začíná číslování uhlíkatého řetězce na aldehydovém atomu uhlíku.



3-methylbutanal

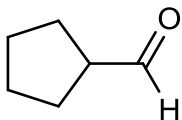


but-3-enal

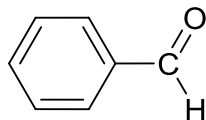


2,3-dihydroxypropanal
glyceraldehyd

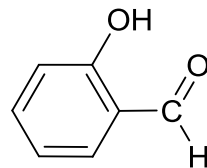
Pro cyklické aldehydy se používá přípona karbaldehyd a u aromatických aldehydů se často používají triviální názvy. Předpona je *formyl-*.



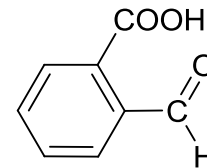
cyklopentankarbaldehyd
formylcyklopentan



benzaldehyd



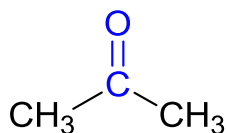
salicylaldehyd
2-hydroxybenzenkarbaldehyd



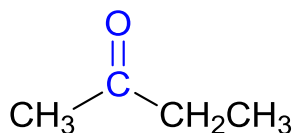
2-formylbenzoová
kyselina

Pro ketony se používá přípona **-on** .

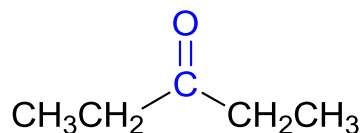
Stejně jako u aldehydů je uhlíkatý řetězec číslován tak, aby tato skupina měla co nejnižší číslo.



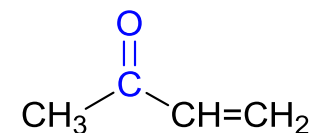
propan**on**
(aceton)



butan-2-**on**

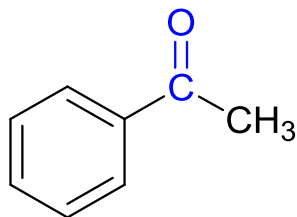


pentan-3-**on**
(diethylketon)

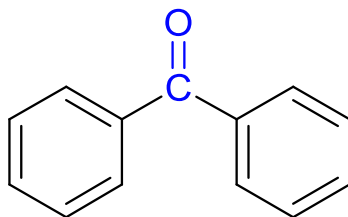


but-3-en-2-**on**
(methylvinylketon)

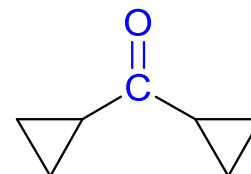
Funkční skupinové názvy se často tvoří tak, že ke slovu keton se připojí názvy připojených alkylových či arylových skupin.



acetofenon
fenylmethylketon

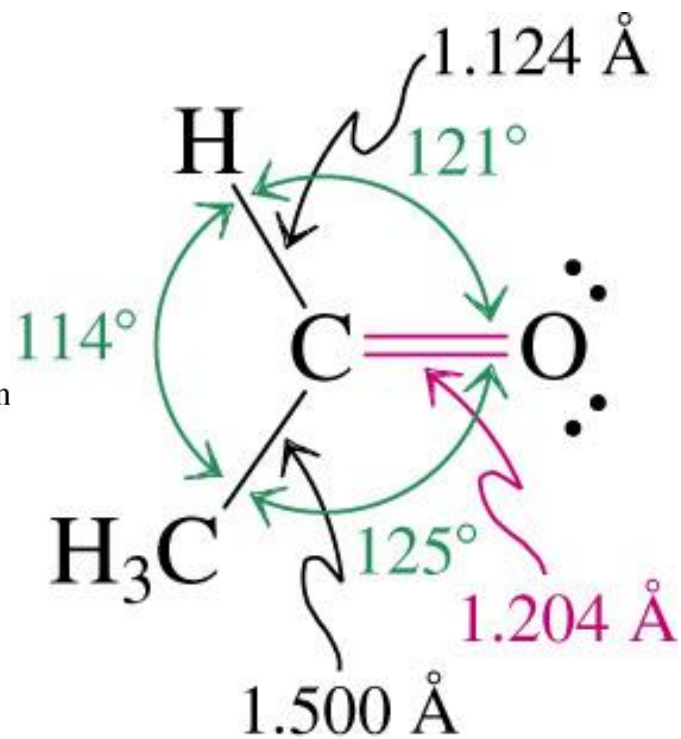
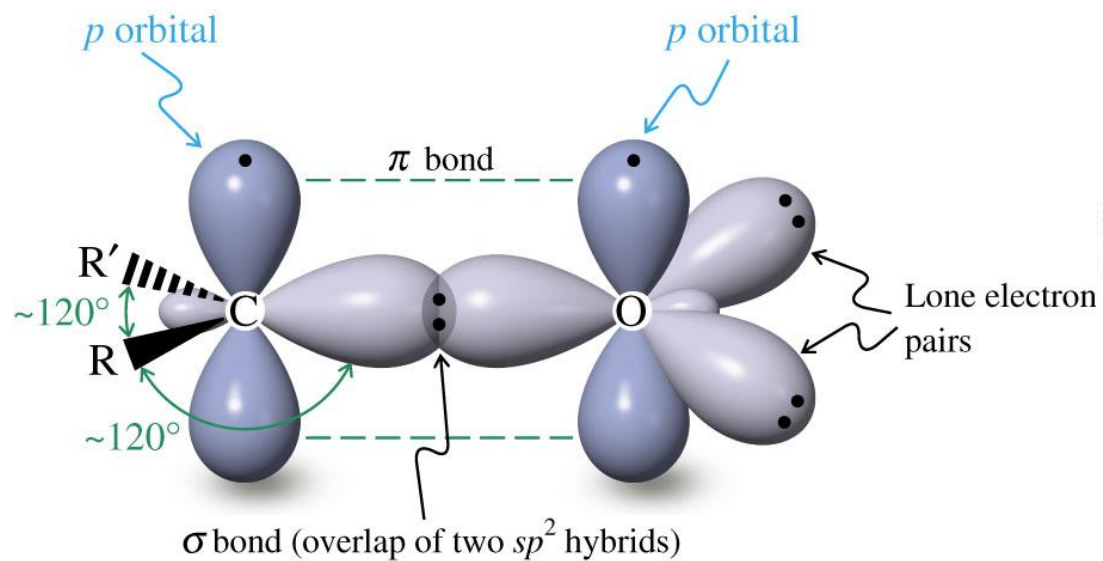


benzofenon
(difenylketon)



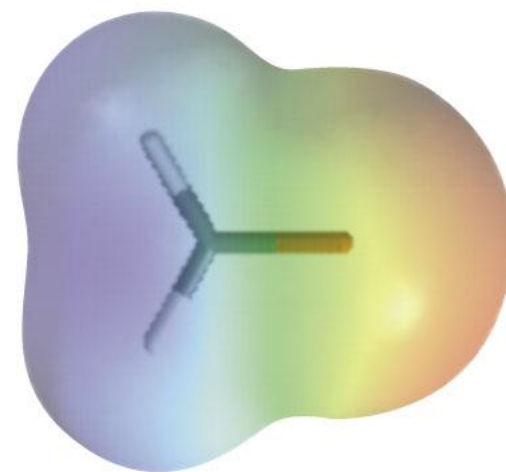
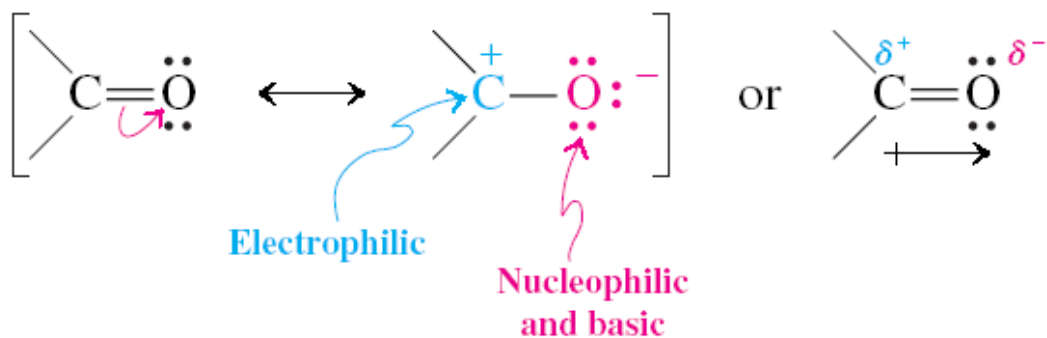
dicyklopropylketon

Struktura karbonylové skupiny



Struktura karbonylové skupiny – elektronová hustota

Descriptions of a Carbonyl Group



Formaldehyde

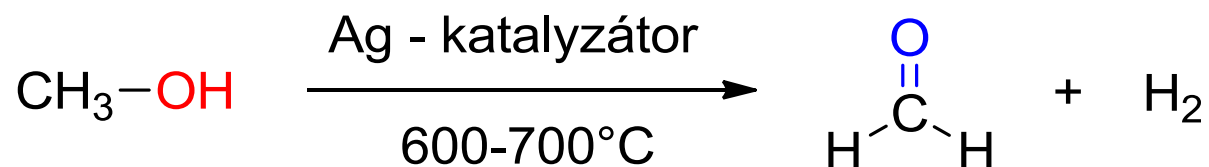
Některé důležitější aldehydy a ketony

Formaldehyd (methanal), plyn (t.v. -21°C).

Velice dobře se rozpouští ve vodě a dodává se jako 37% roztok.

Průmyslově se vyrábí oxidací methanolu na stříbrných katalyzátorech.

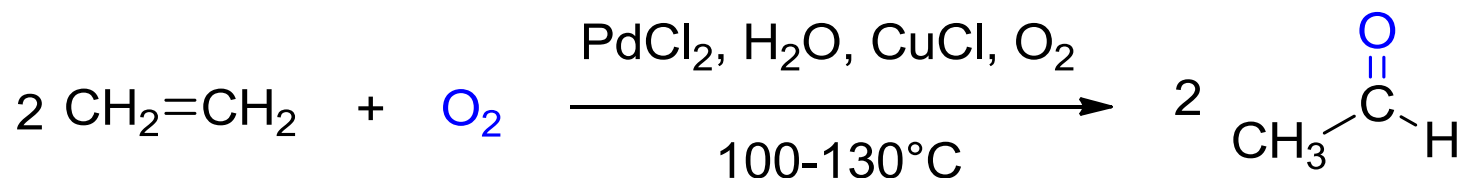
Konzervační činidlo, uplatňuje při výrobě plastických hmot (tzv. fenolformaldehydové pryskyřice).



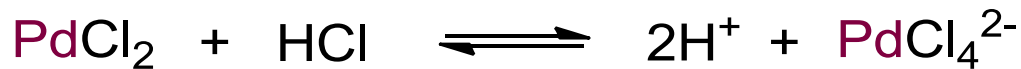
Acetaldehyd (ethanal) (t.v. 20°C).

Vyrábí selektivní katalytickou oxidací ethylenu v přítomnosti složeným z Pd^{2+} a Cu^{1+} tzv. Wackerova oxidace.

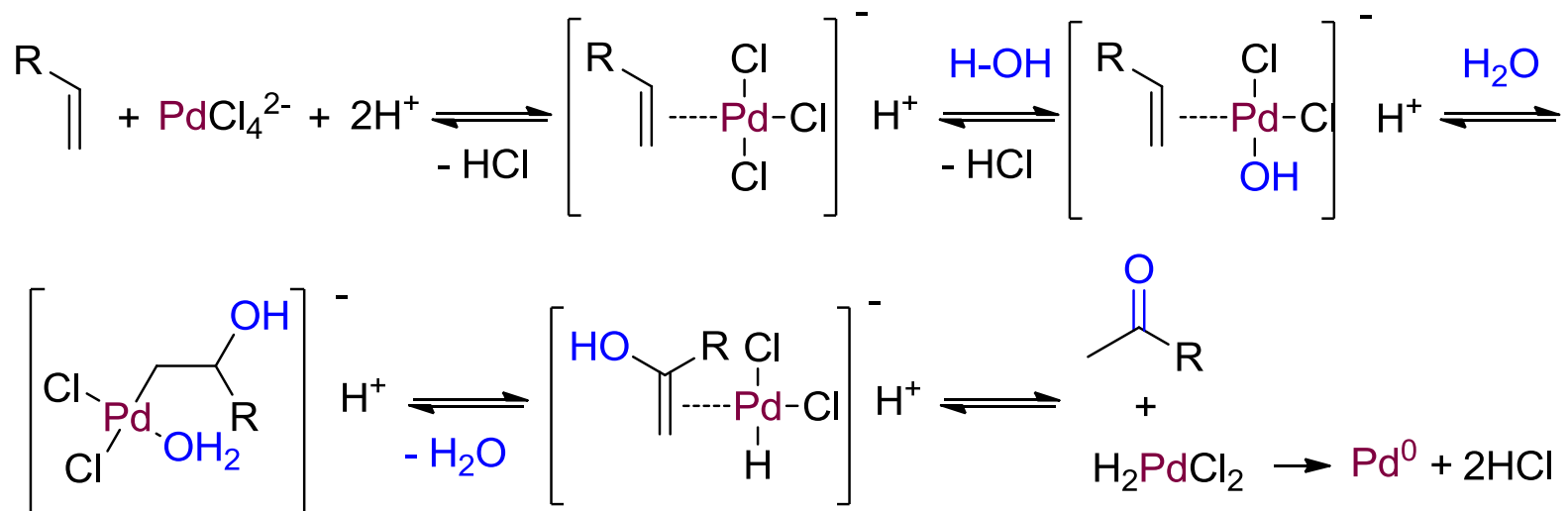
Acetaldehyd se oxiduje buď na CH_3COOH nebo se používá na výrobu 1-butanolu atd.



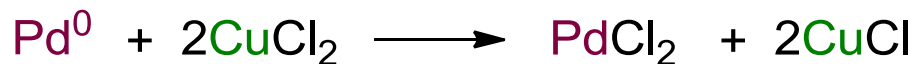
První krok (vznik katalyticky aktivní částice)



Druhý krok (vlastní hydratace dvojné vazby)



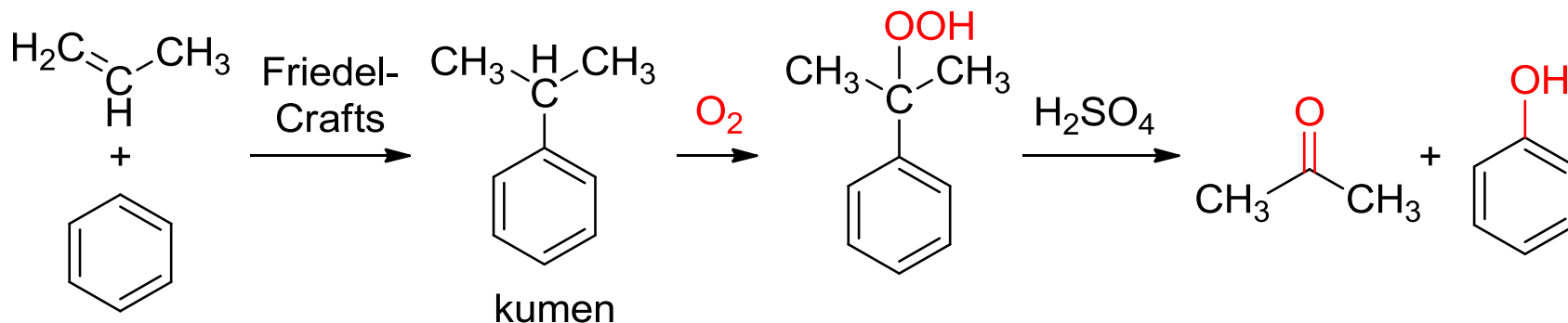
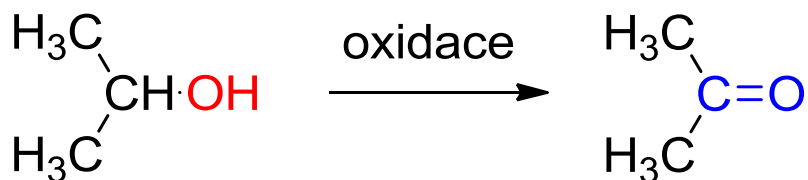
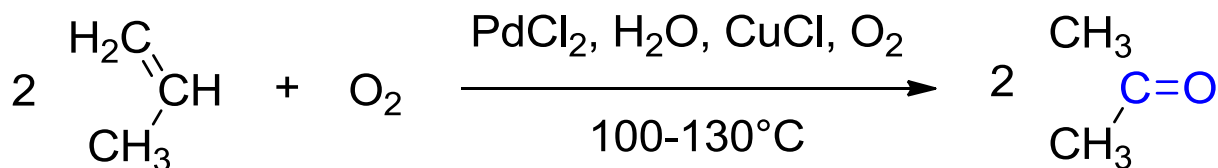
Třetí krok (regenerace katalyzátoru)



Nejjednodušším členem ketonů je aceton (t.v. 56°C)

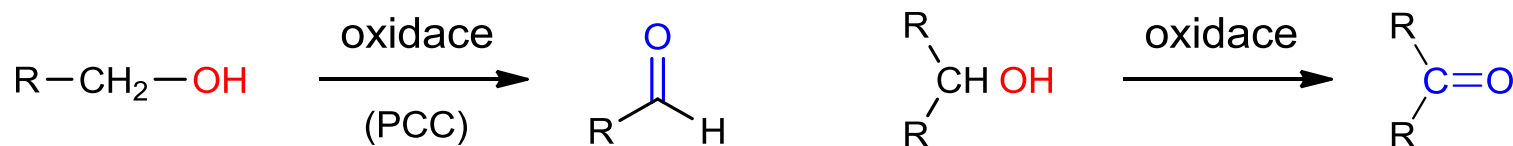
Průmyslově se vyrábí v milionech tun buď Wackerovou oxidací propenu, oxidací isopropylalkoholu a nebo oxidací isopropylbenzenu.

Používá přímo jako rozpouštědlo, je mísitelný jak s vodou, tak s celou řadou ostatních organických rozpouštědel.

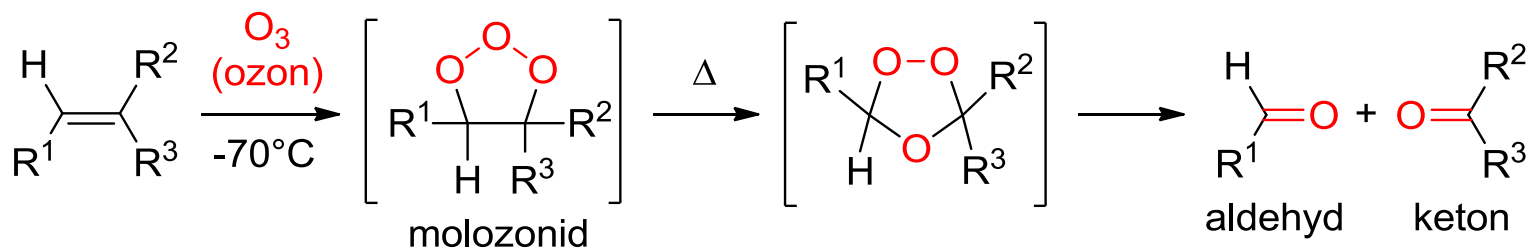


Syntéza aldehydů a ketonů

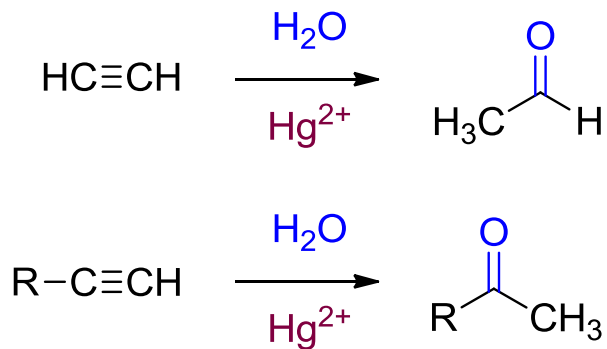
Oxidace alkoholů



Ozonolýza alkenů



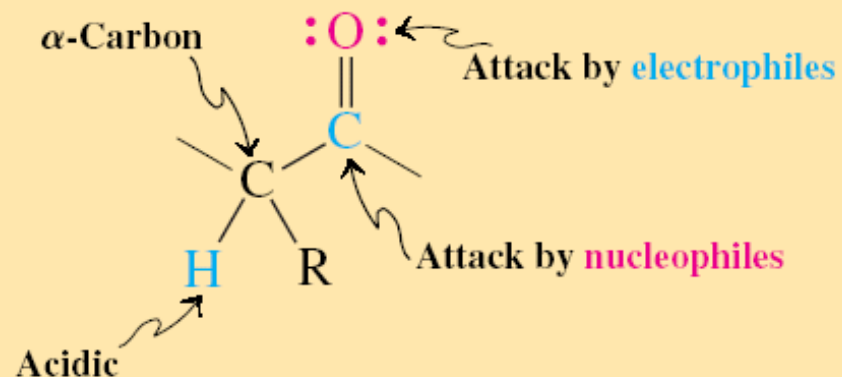
Hydratace terminálních alkynů katalyzovaná rtuťnatými ionty



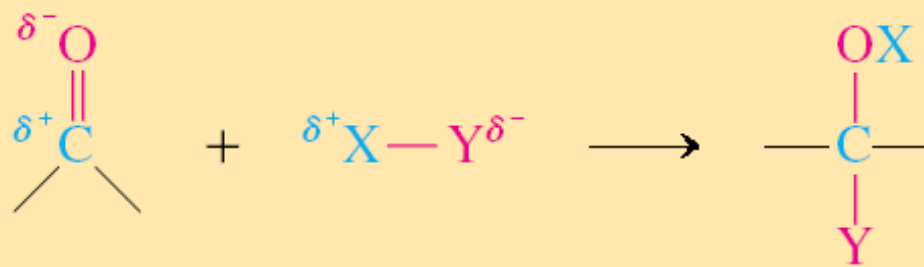
Wackerova oxidace

Reaktivita aldehydů a ketonů

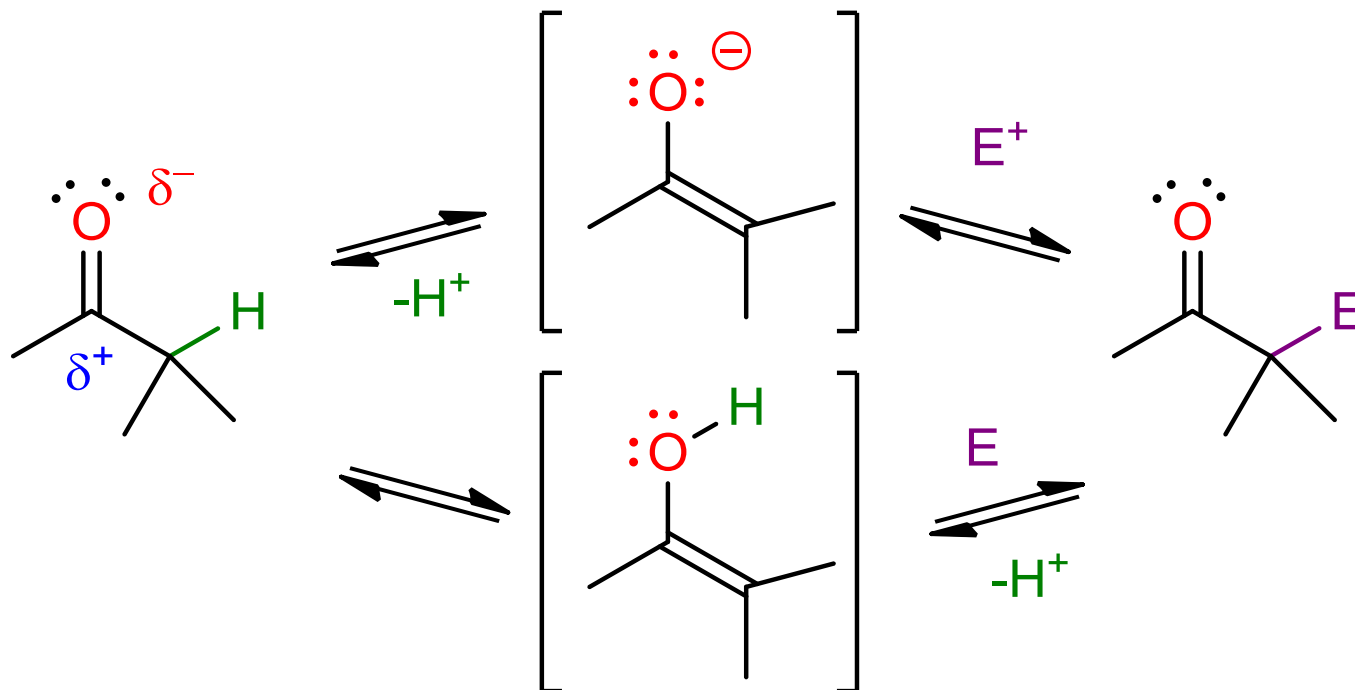
Regions of Reactivity in Aldehydes and Ketones



Ionic Additions to the Carbonyl Group

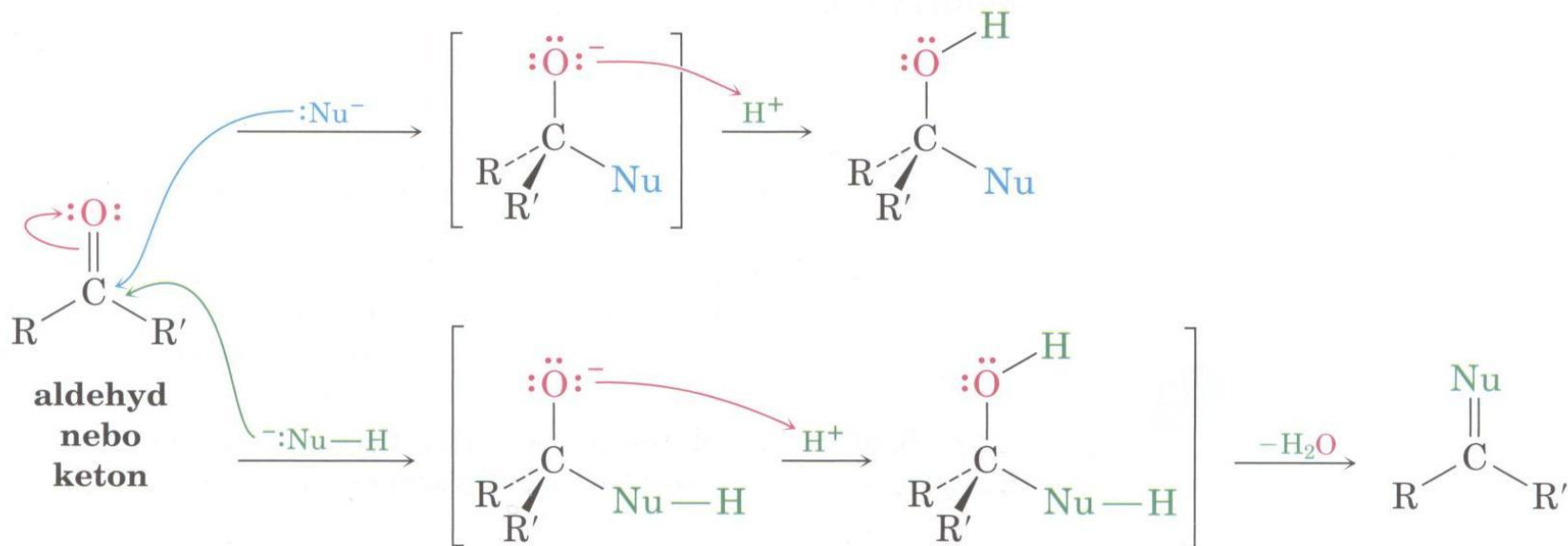
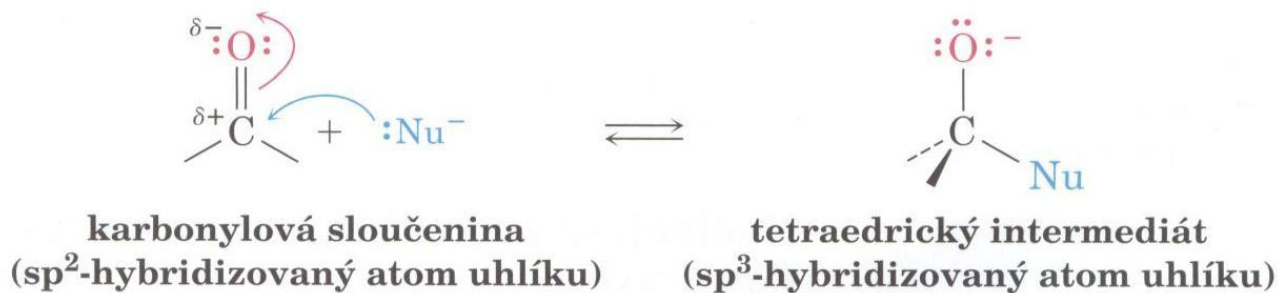


Reaktivita v α -poloze

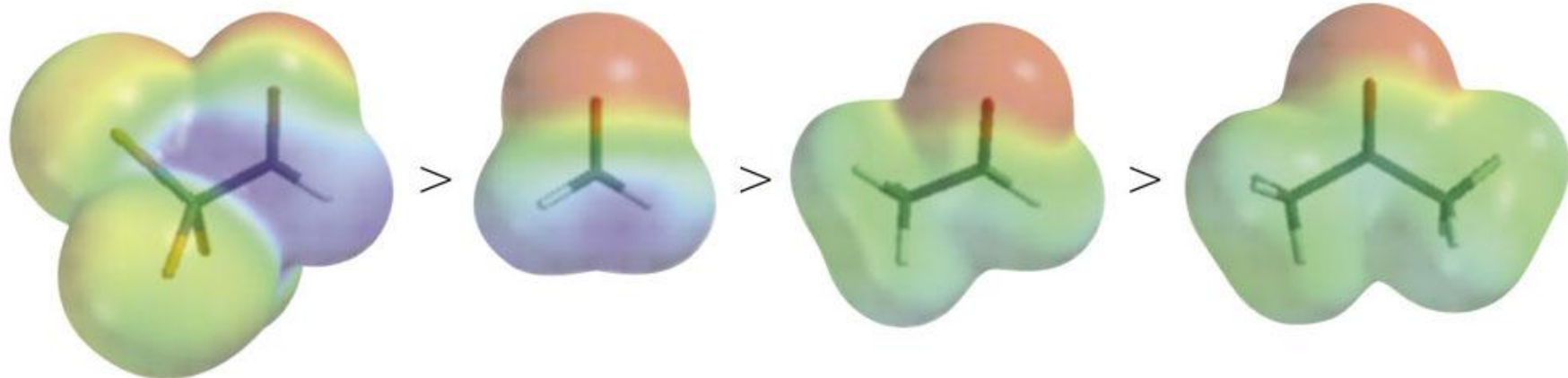


Téma speciální (přesprávní) přednášky

Reaktivita aldehydů a ketonů – nukleofilní adice



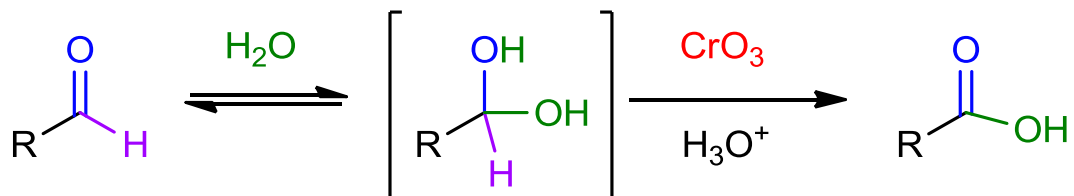
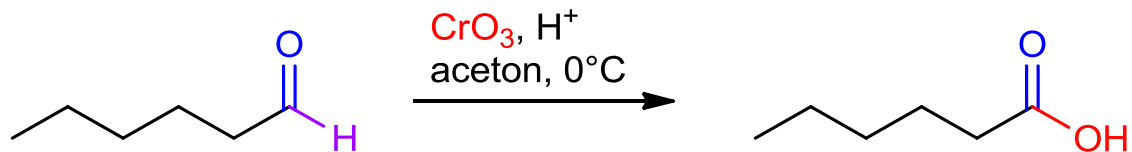
Relative Reactivities of Carbonyl Groups: Aldehydes Are More Reactive than Ketones



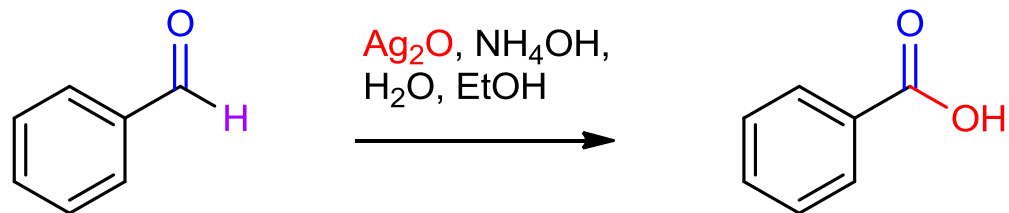
Electron-withdrawing CCl_3 group
generates additional positive
charge at carbonyl carbon

Electron-donating CH_3 groups
reduce positive charge at carbonyl carbon

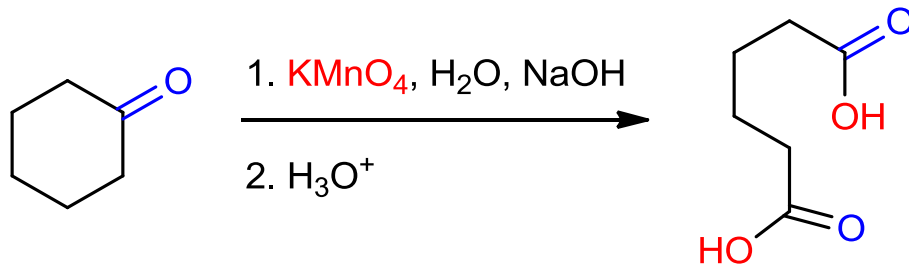
Reaktivita aldehydů a ketonů – oxidace



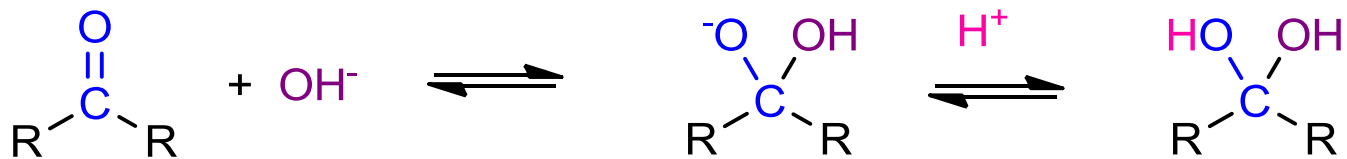
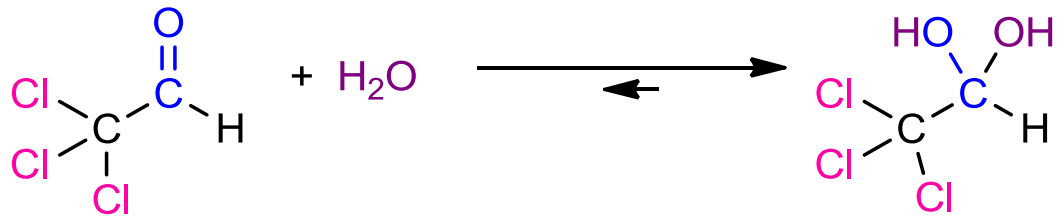
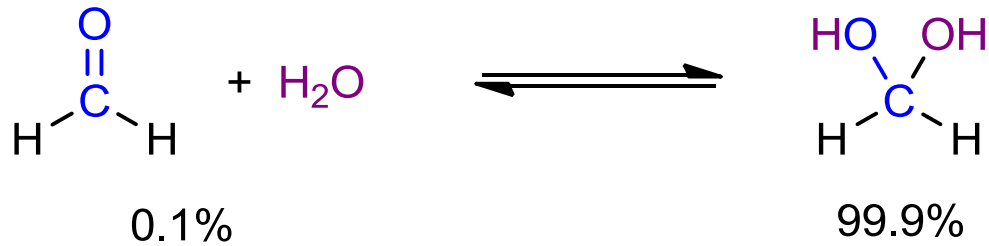
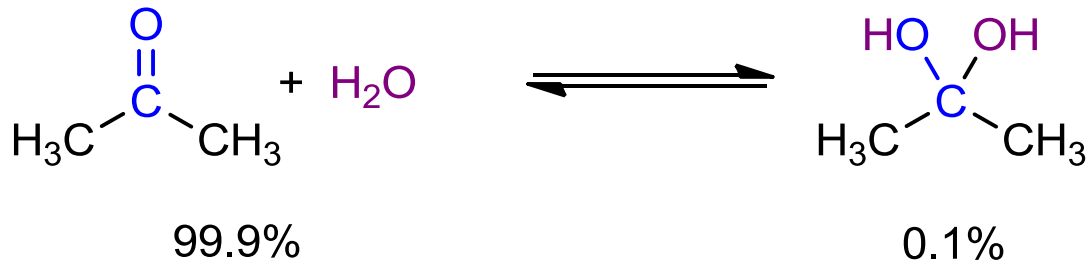
Tollensova reakce



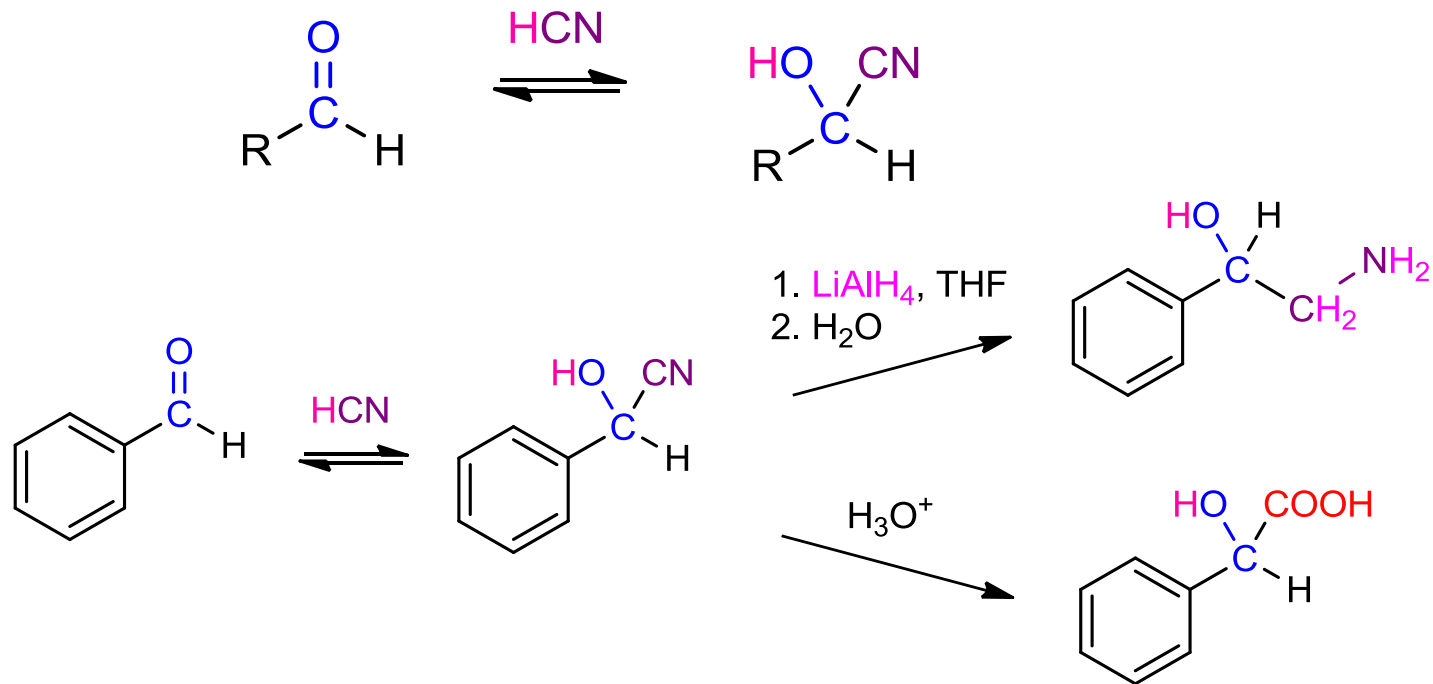
Ketony lze oxidovat pouze velmi silnými činidly na dikyseliny



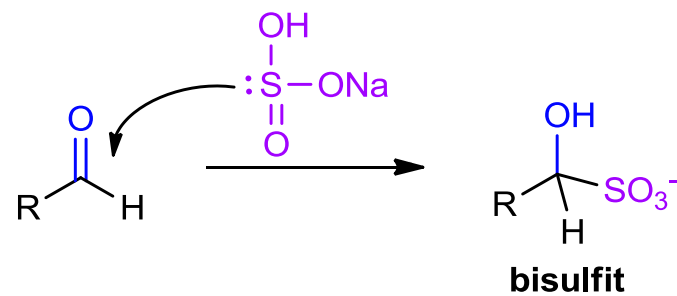
Adice vody



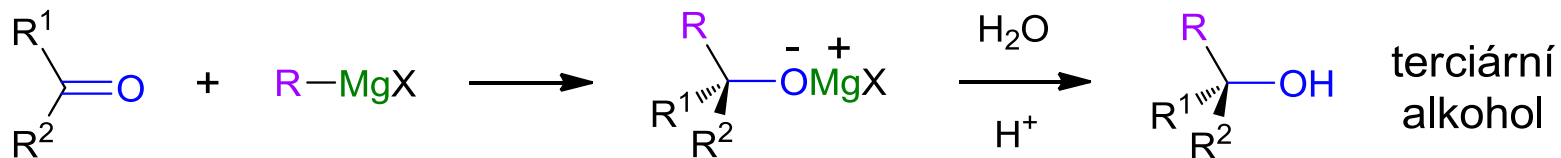
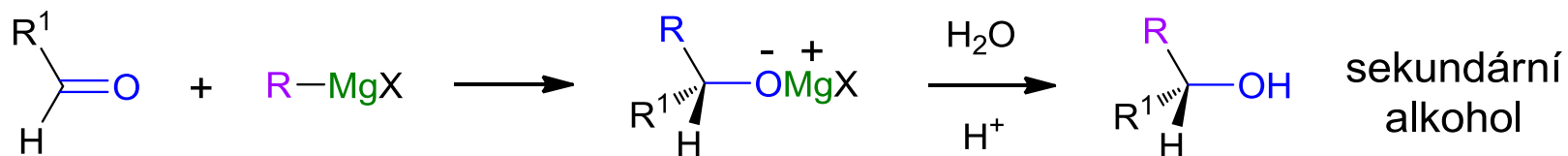
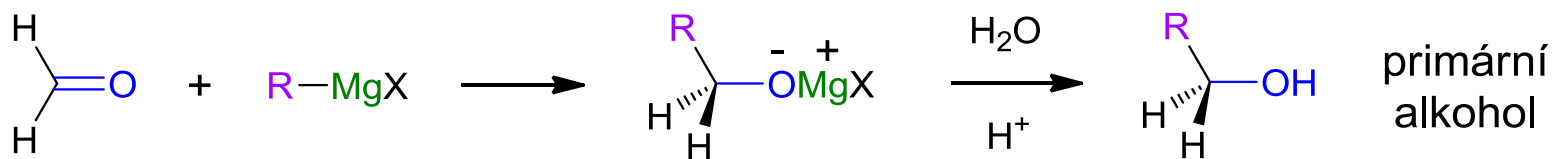
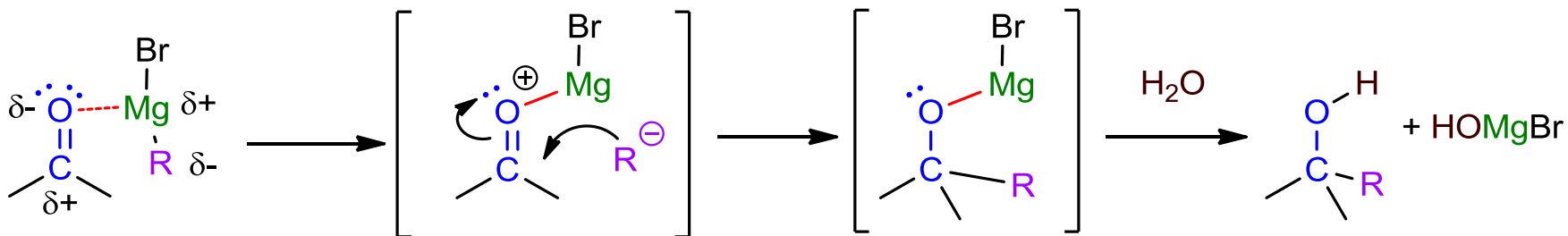
Adice kyanovodíku - kyanhydriny



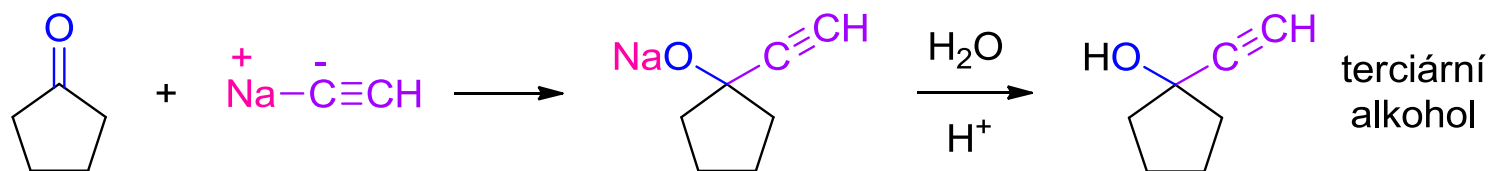
Adice hydrogensířičitanu sodného - bisulfit



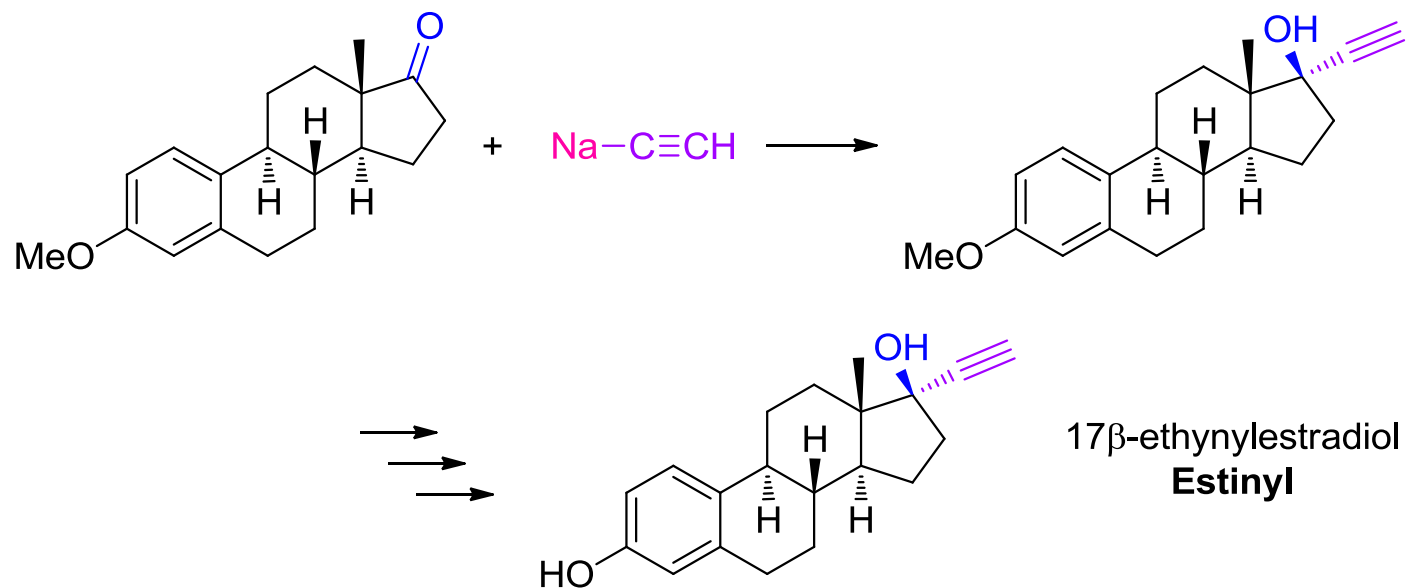
Adice Grignardových činidel



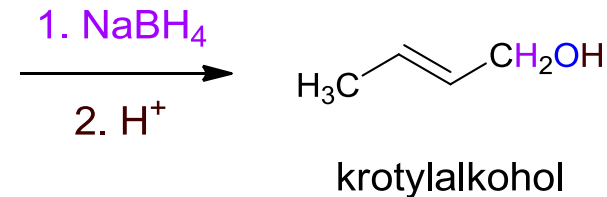
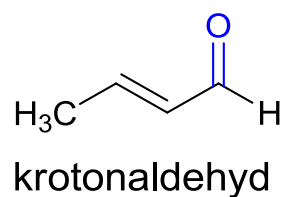
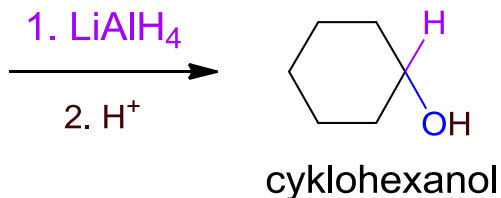
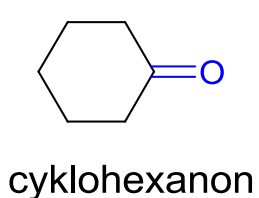
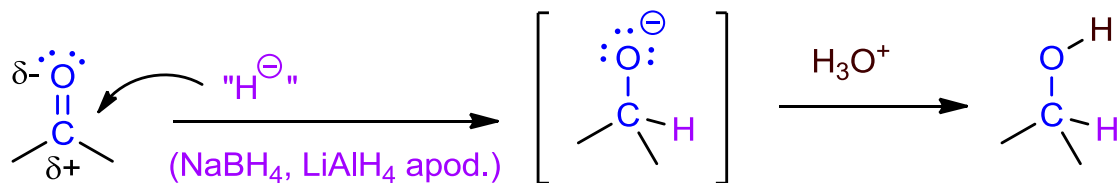
Reakce karbonylových sloučenin s acetylidy vede k tvorbě propargylových alkoholů.



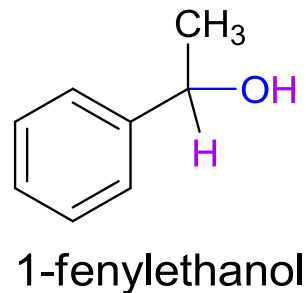
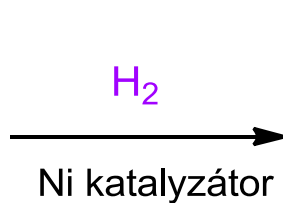
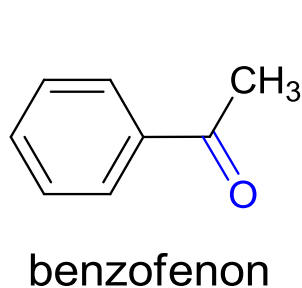
Tato reakce byla využita i k přípravě jednoz prvních syntetických derivátů estrogenů – ethynylestradiolu (Estinyl). (Inhoff, Schering AG, 1938)



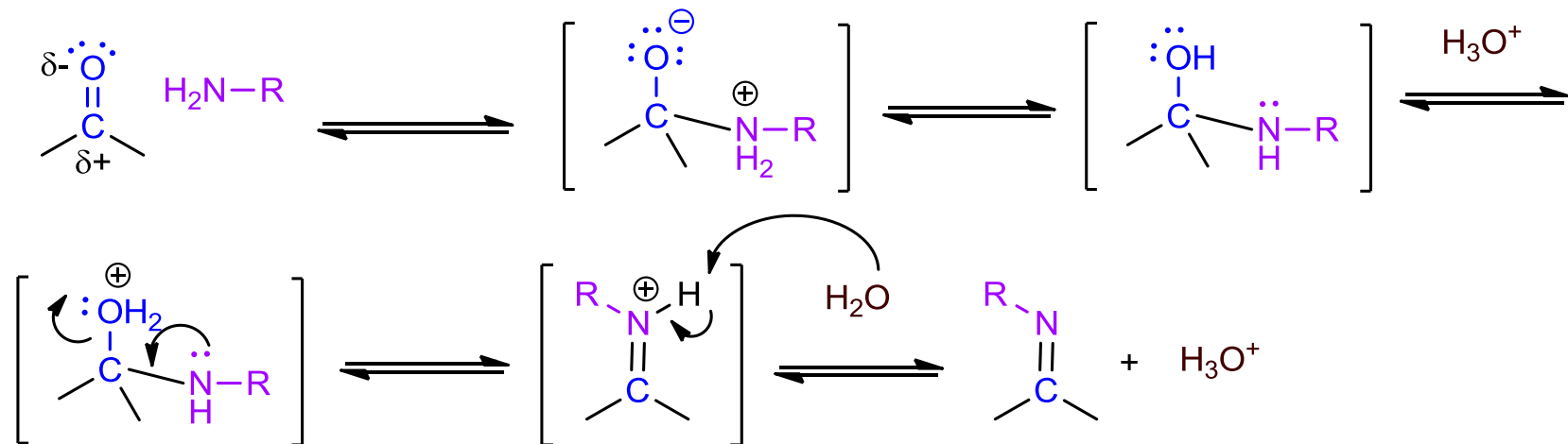
Adice „hydridového aniontu“ - redukce



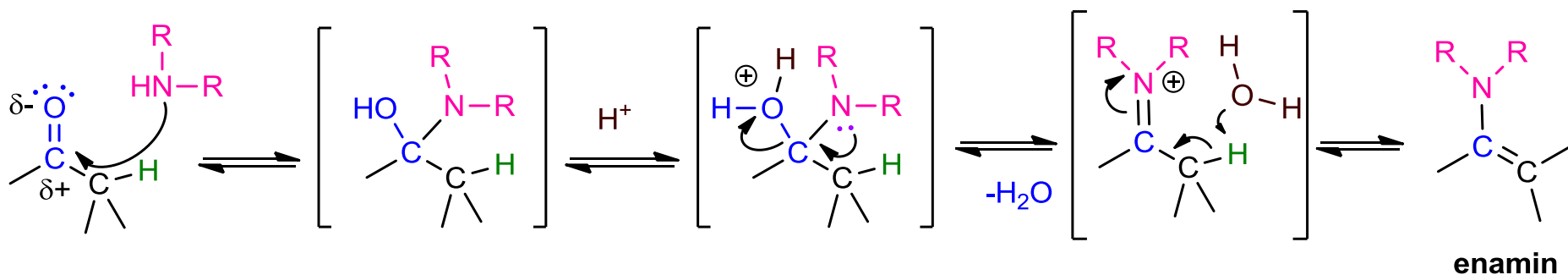
Adice vodíku – katalytická hydrogenace



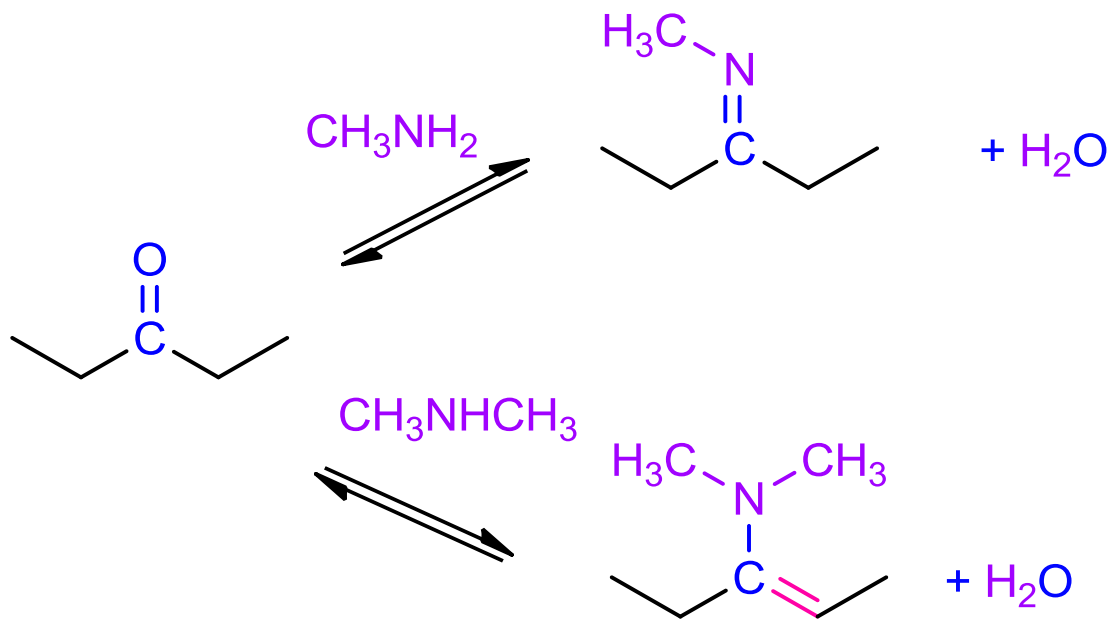
Adice primárních aminů – iminy (Schiffovy báze)



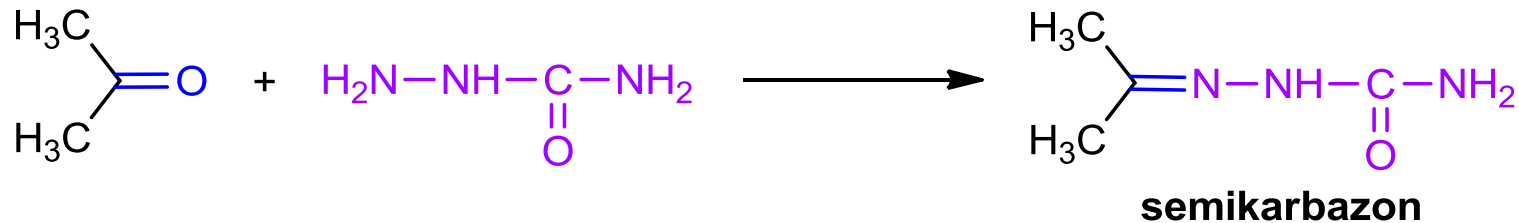
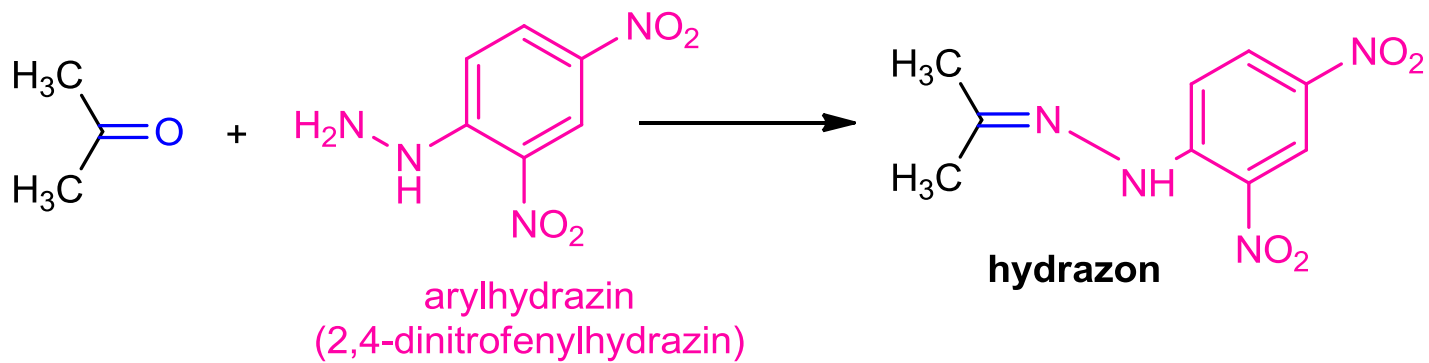
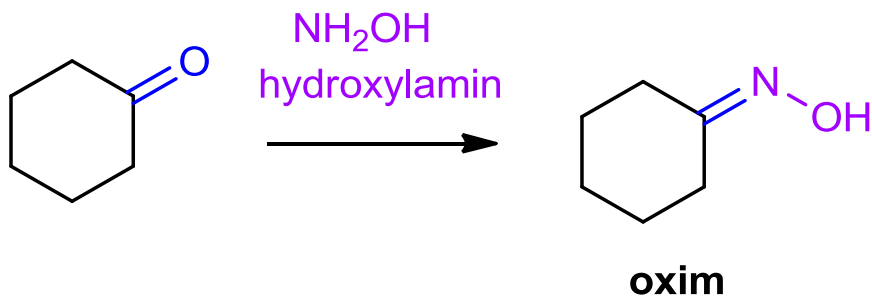
Adice sekundárních aminů – enaminy



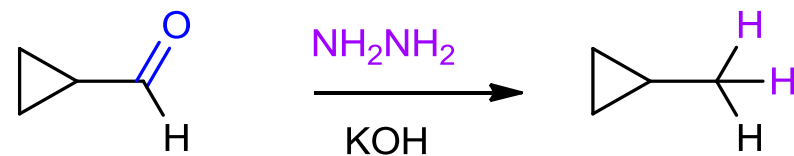
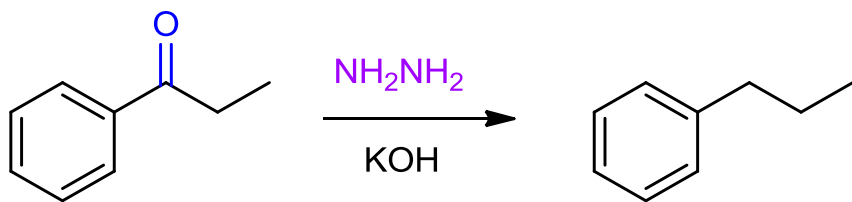
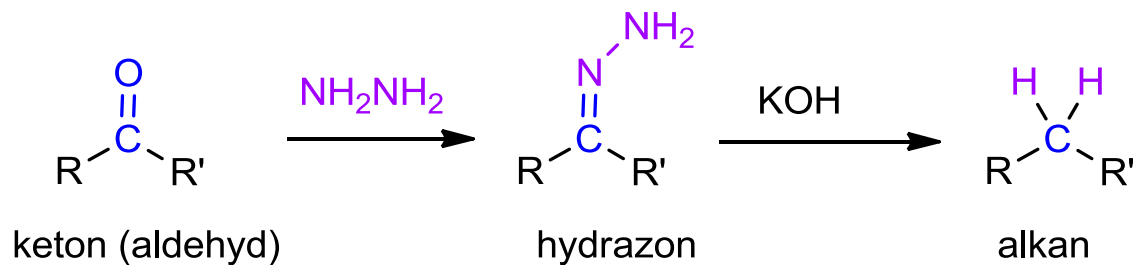
Adice aminů – tvorba iminů nebo enaminů



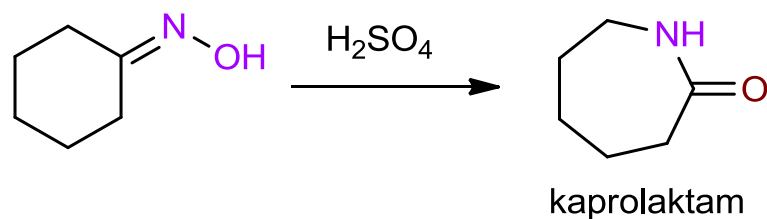
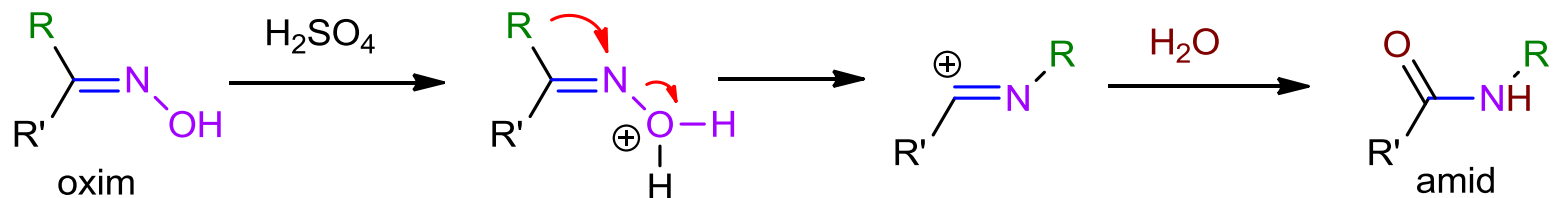
Oximy, hydrazony a příbuzné deriváty



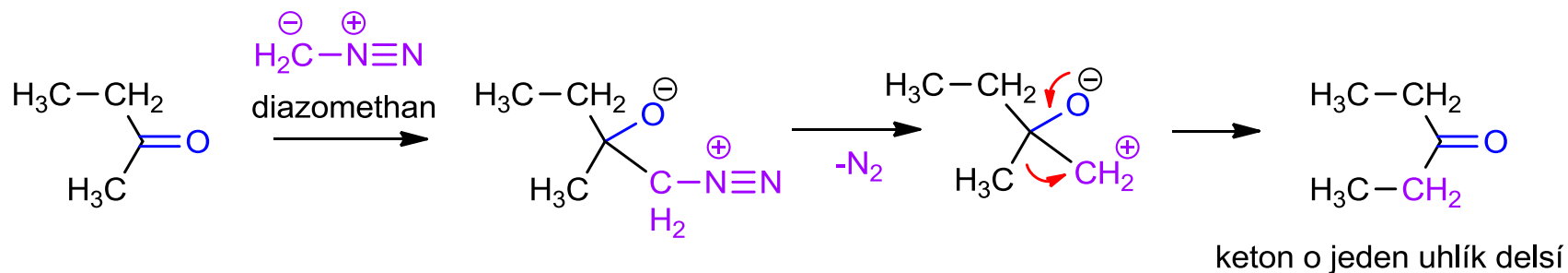
Wolff-Kižněrova redukce – transformace ketonů na alkany



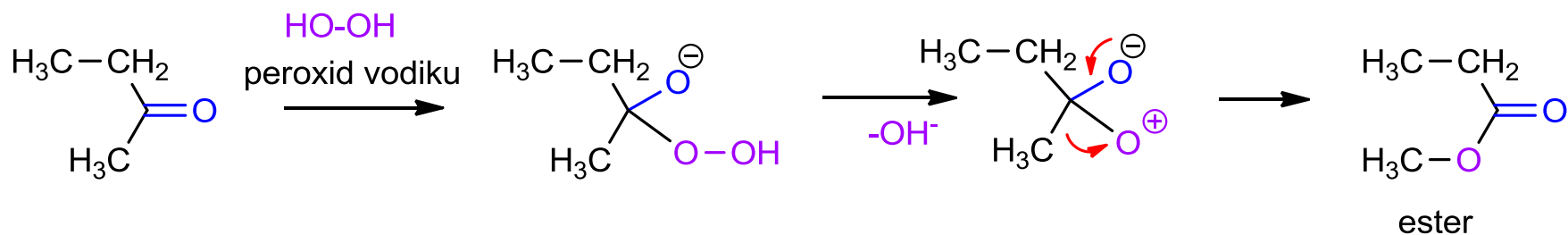
Beckmannův přesmyk oximů



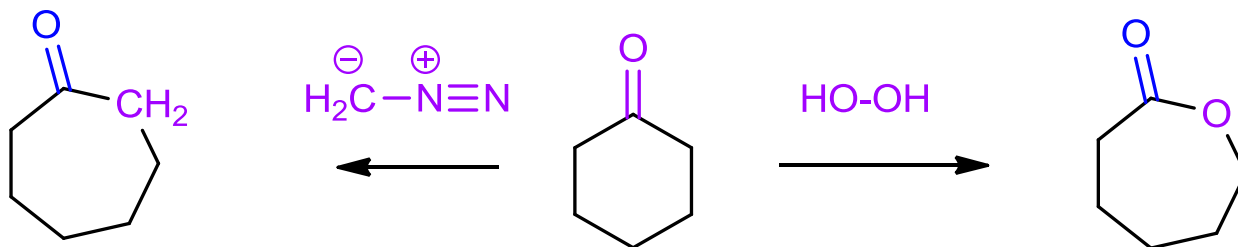
Reakce ketonů s diazomethanem - homologace



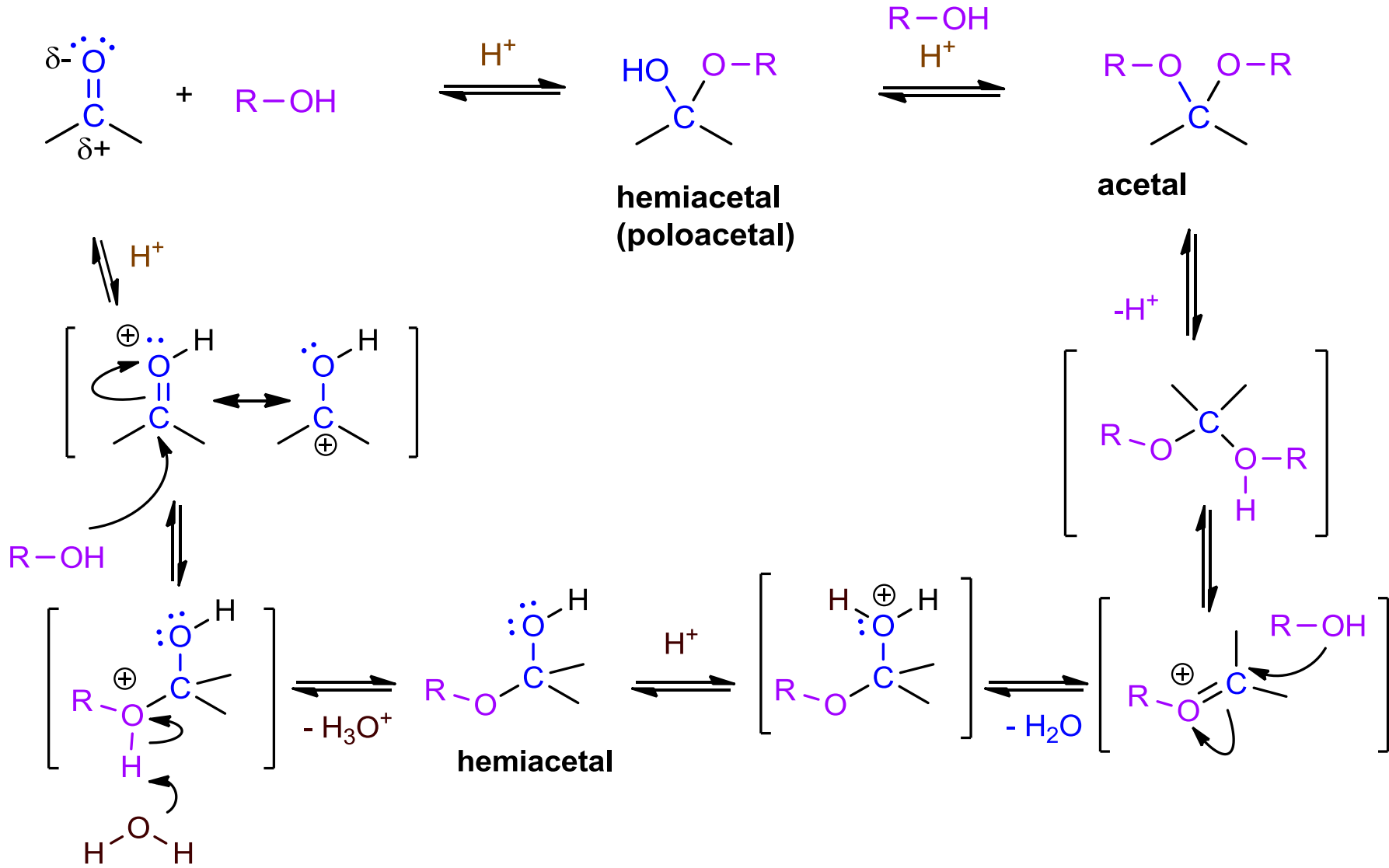
Baeyer-Villigerova reakce



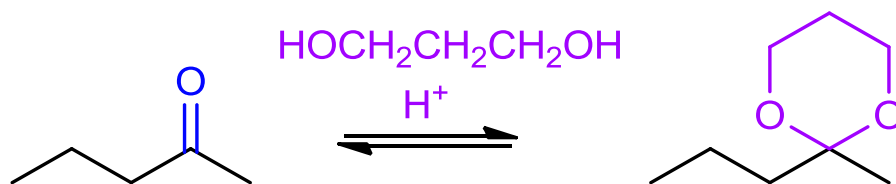
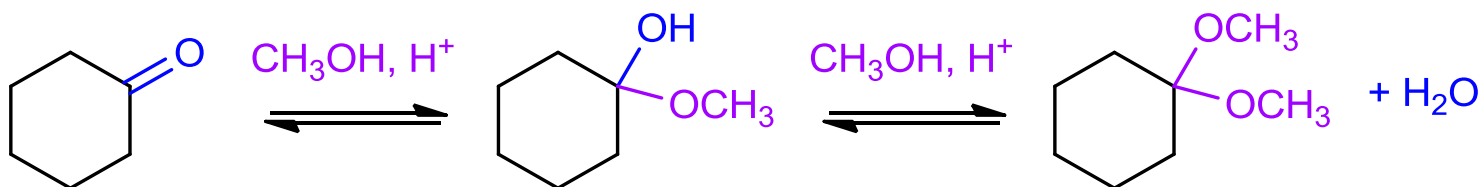
Obě tyto reakce se používají hlavně na cyklické a symetrické ketony



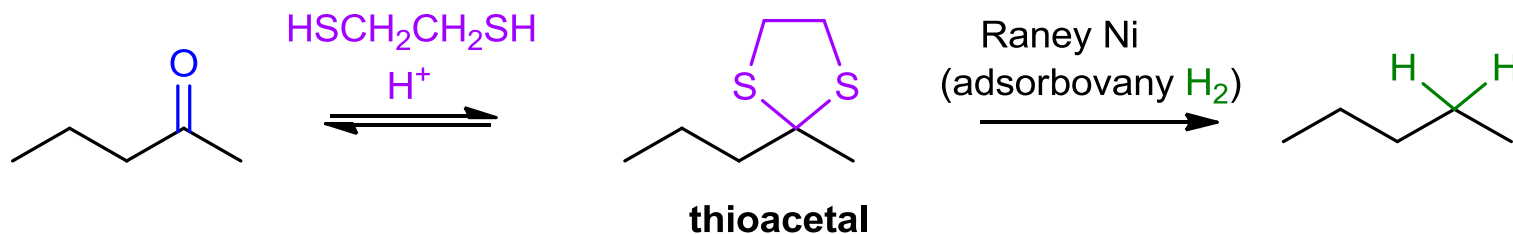
Adice alkoholů – acetyly a hemiacetyly



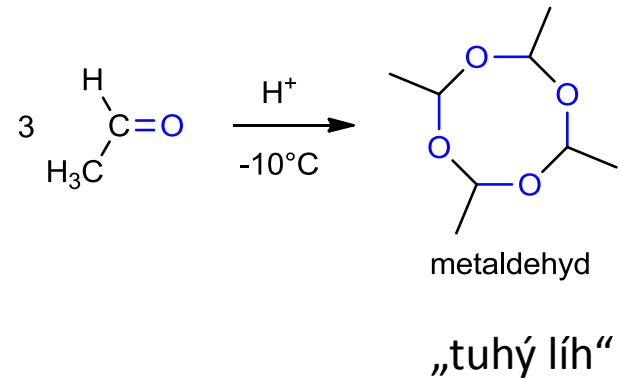
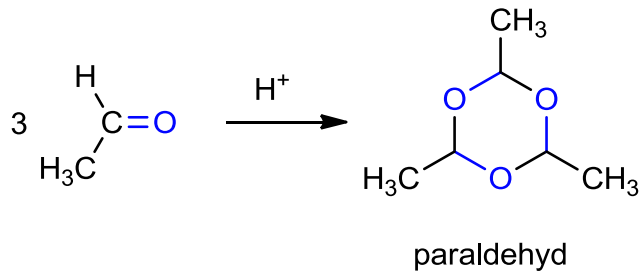
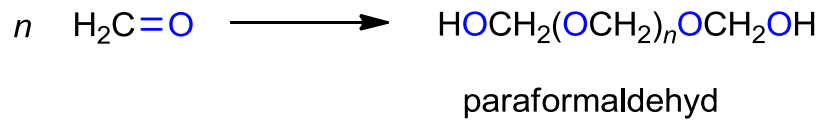
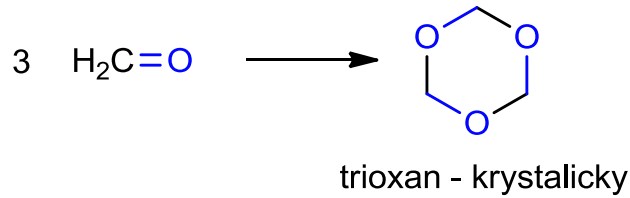
Adice alkoholů – acetaly a hemiacetaly



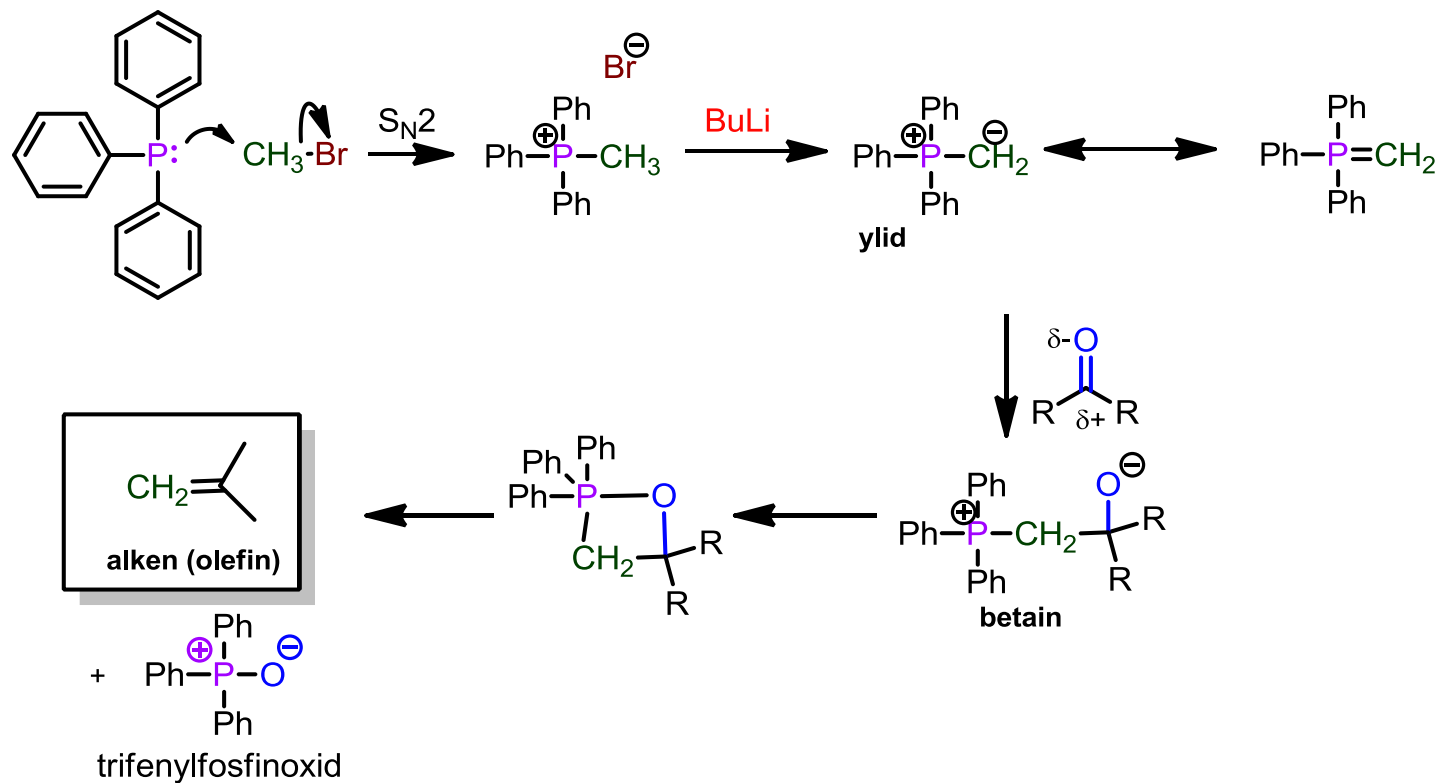
Adice dithiolů – thioacetaly a katalytická redukce na alkany



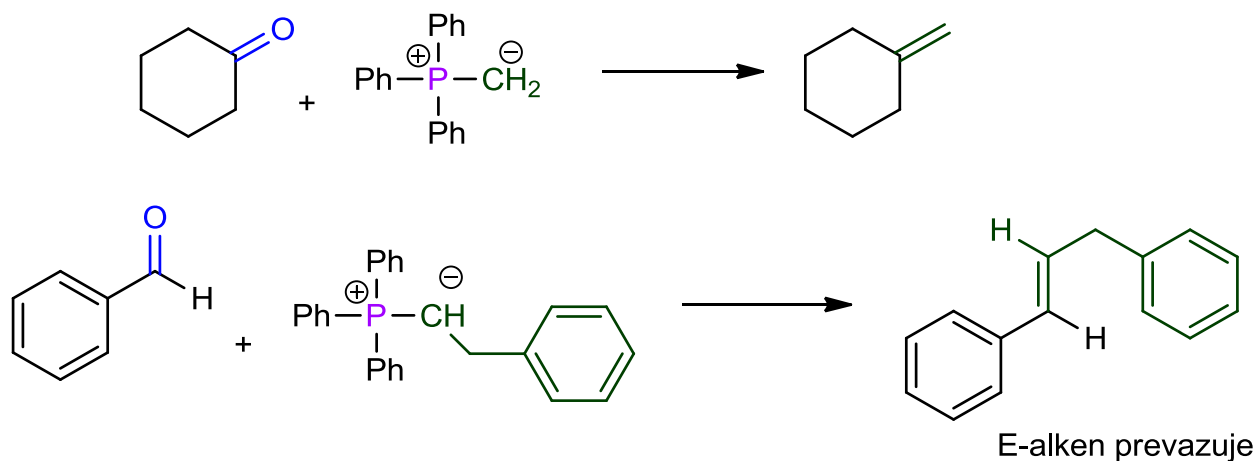
Oligomery a polymery aldehydů



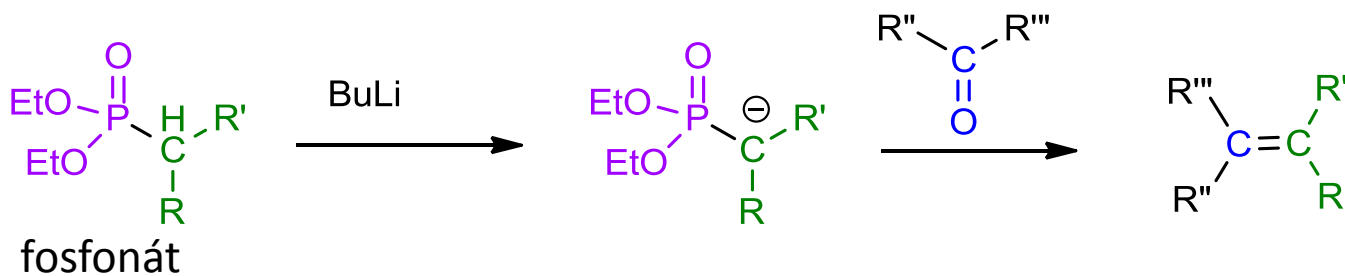
Adice fosforových ylidů – Wittigova reakce



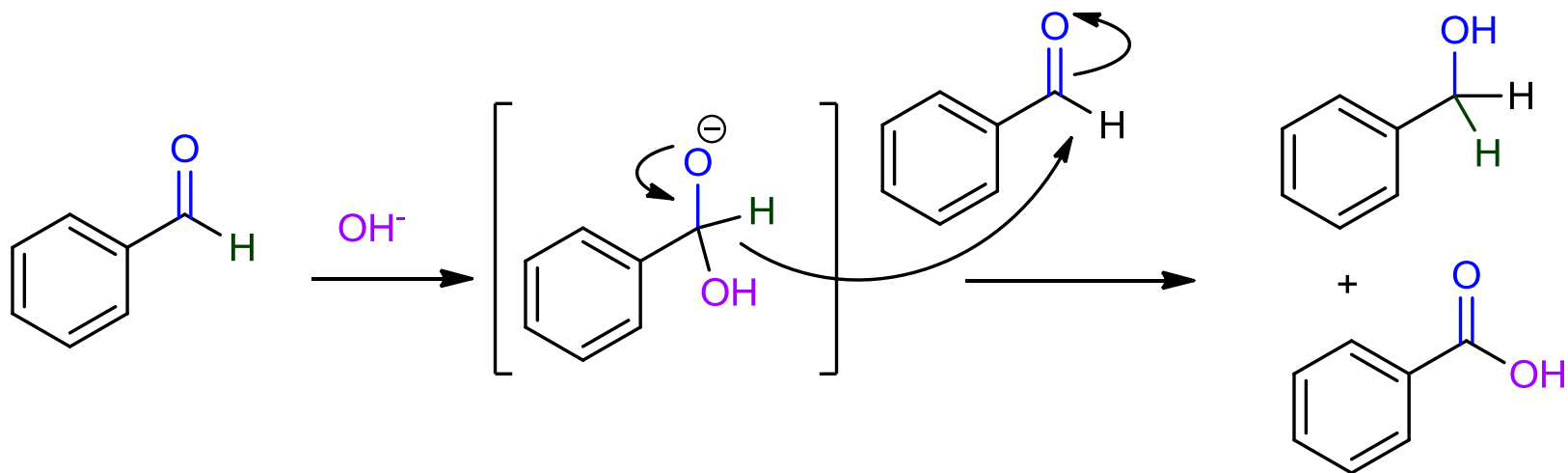
Adice fosforových ylidů – Wittigova reakce



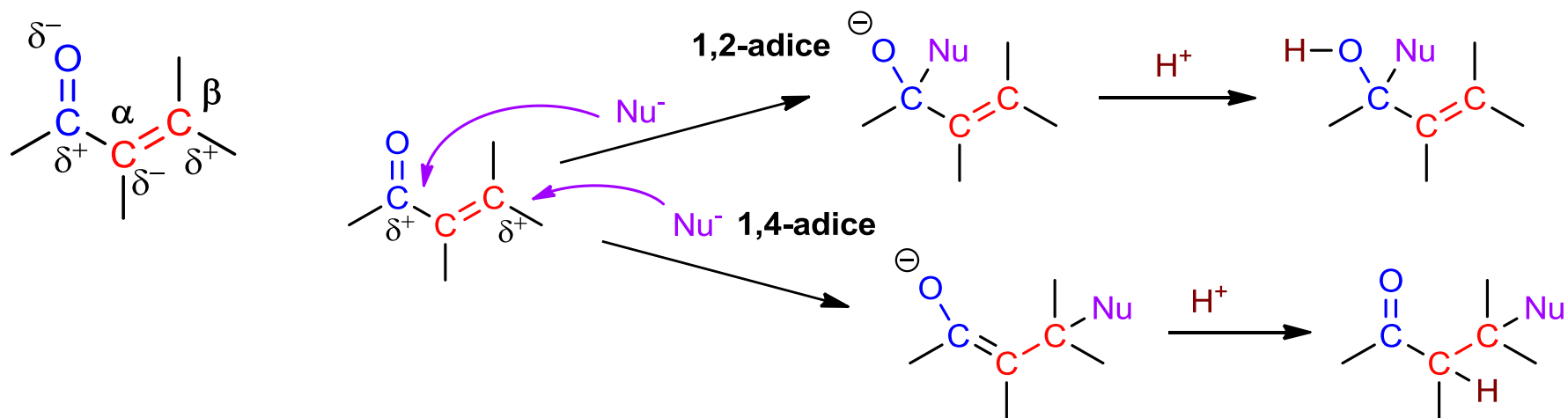
Horner-Emmonsova (Horner-Wittigova, Wadsworth-Emonsova) reakce



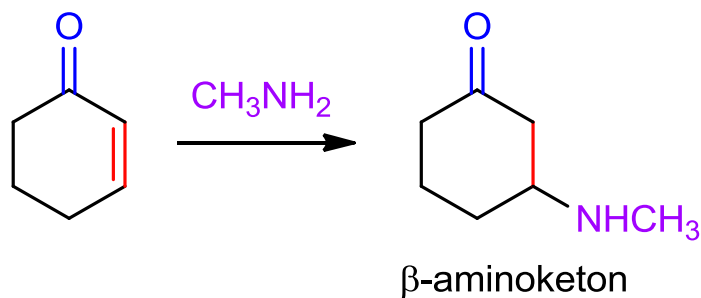
Canizzarova reakce – disproportionace (neenolizovatelných) aldehydů



α,β -Nenasycené aldehydy a ketony - konjugované adice



Adice aminů probíhají obvykle 1,4-adicí



Adice Gilmanových kuprátů probíhají výhradně 1,4-adicí

