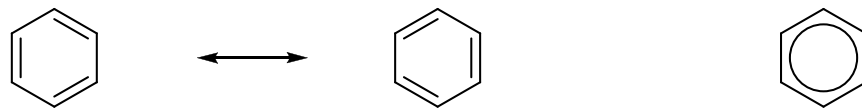
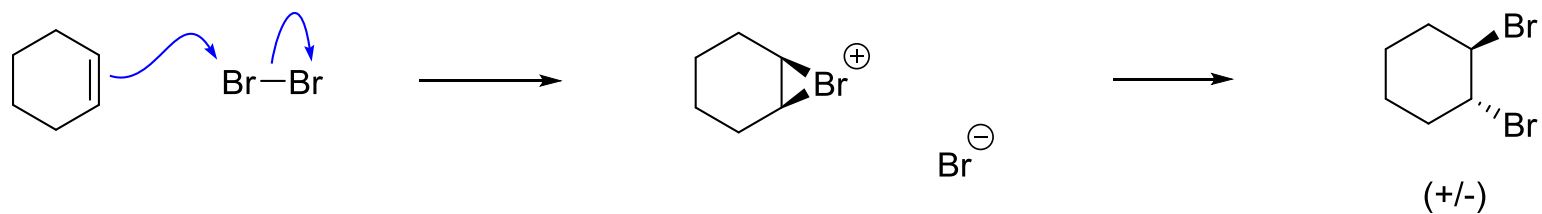


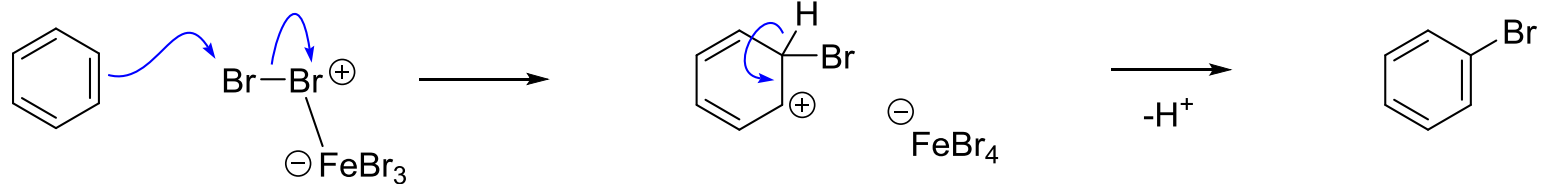
# ELEKTROFILNÍ AROMATICKÁ SUBSTITUCE



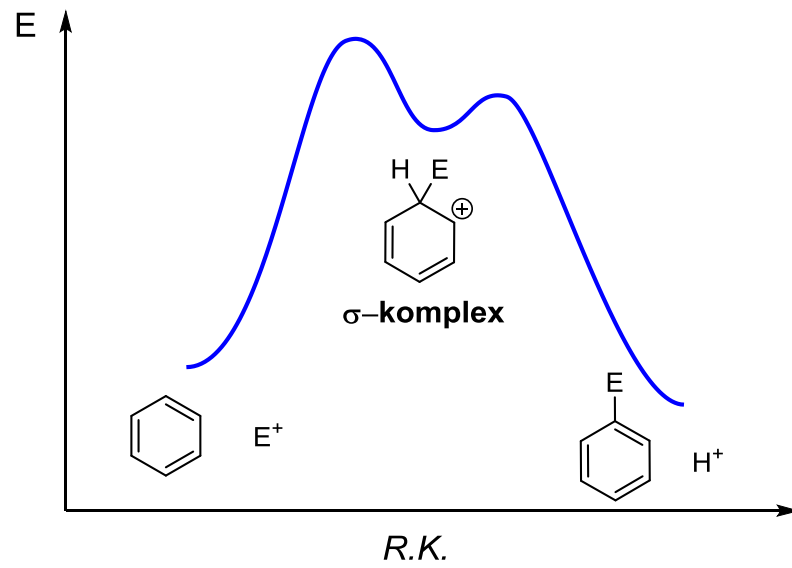
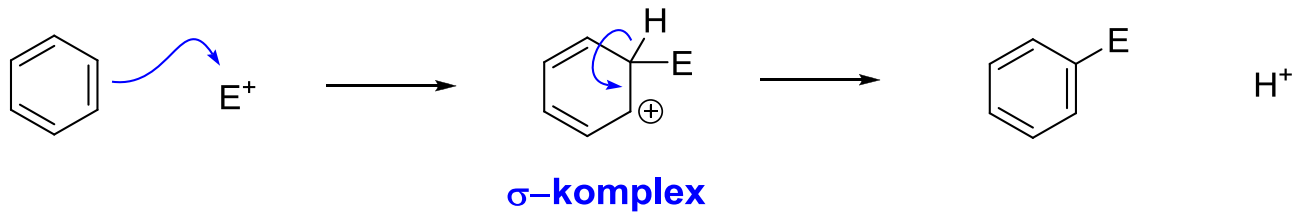
## Elektrofilní adice $A_E$



## Elektrofilní aromacká substituce $S_EAr$



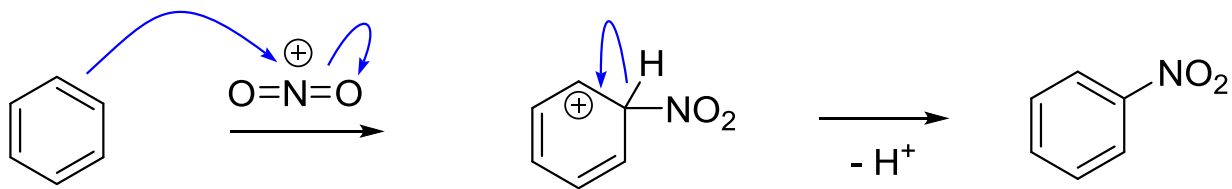
# MECHANISMUS $S_EAr$



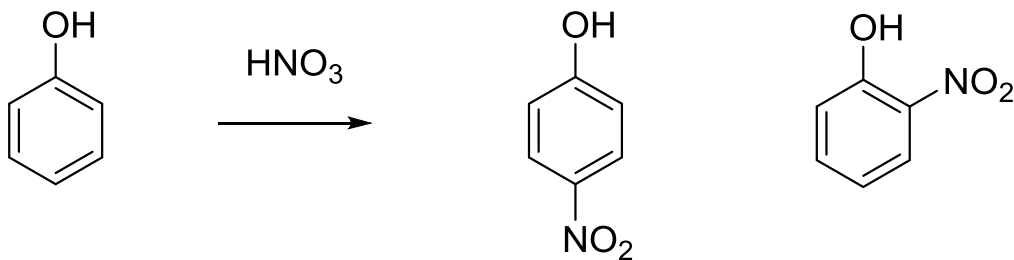
# ELEKTROFILY

## Nitrace ( $\text{NO}_2^+$ )

nitrační směs

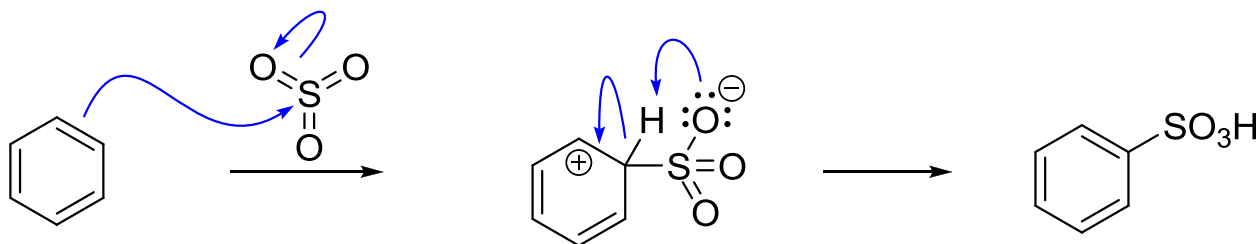
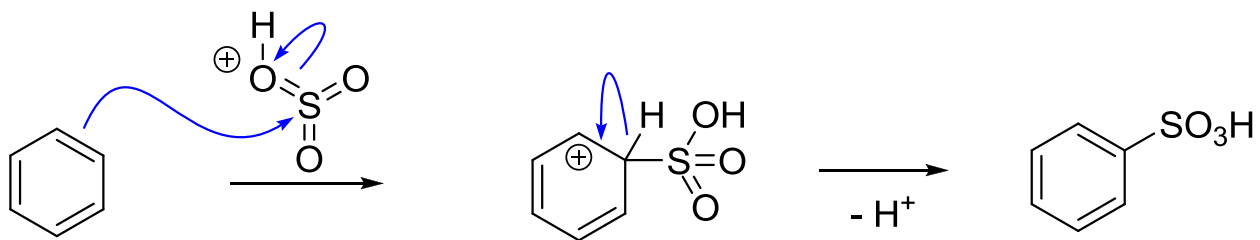
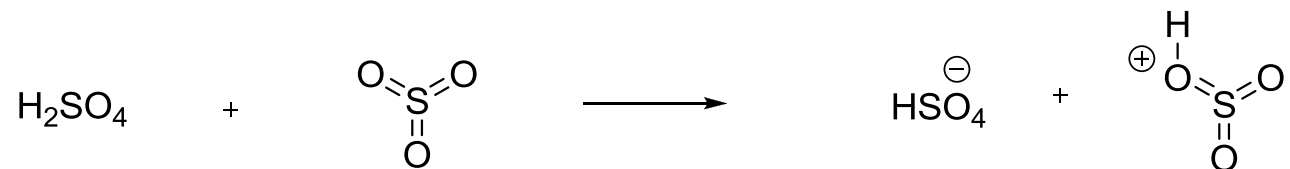


k nitraci aktivovaných aromátů stačí samotná  $\text{HNO}_3$



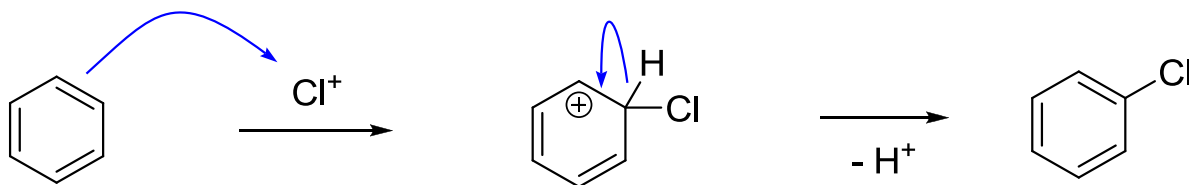
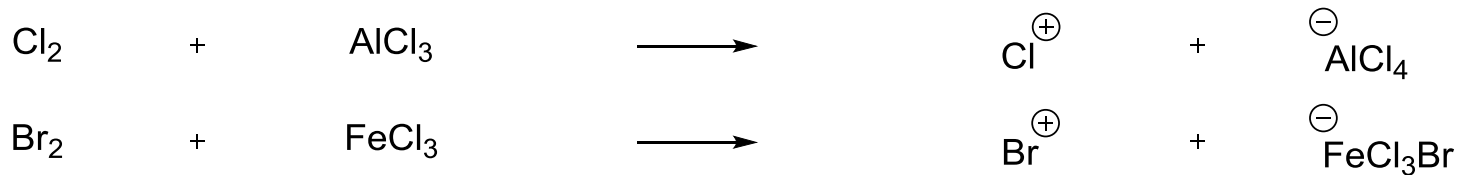
# ELEKTROFILY

## Sulfonace ( $\text{SO}_3\text{H}^+$ nebo $\text{SO}_3$ )

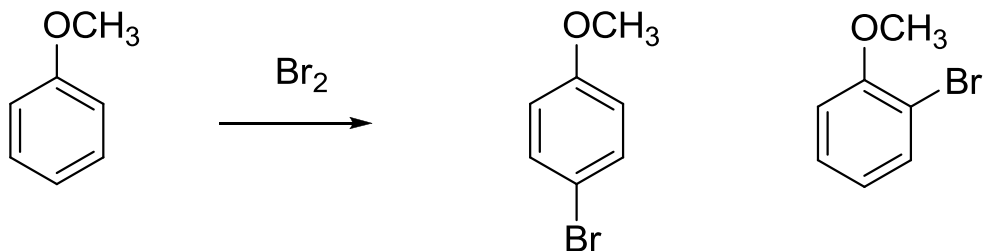


# ELEKTROFILY

## Halogenace ( $X^+$ )

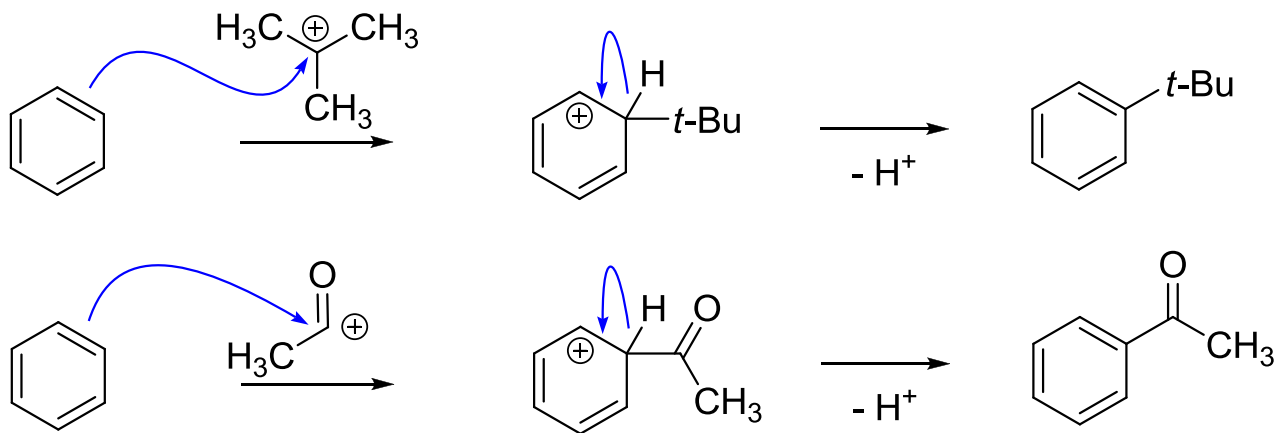
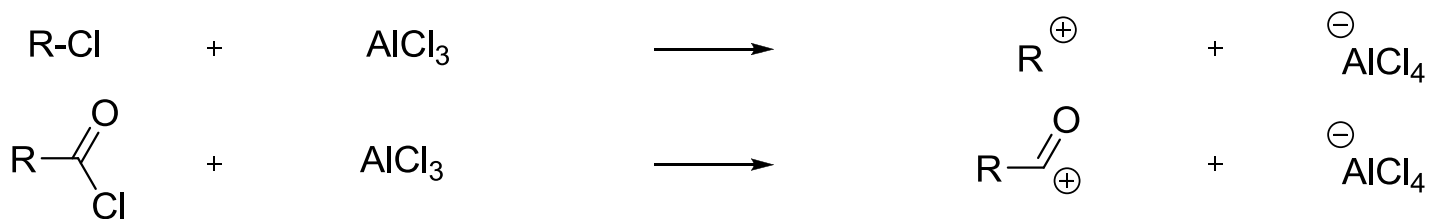


k halogenaci aktivovaných aromátů stačí  $X_2$



# ELEKTROFILY

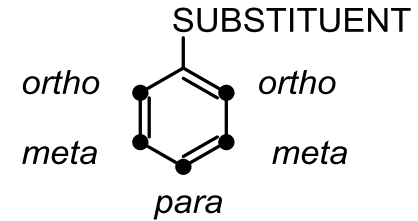
## Friedelova-Craftsova alkylace a acylace ( $R^+$ a $R-\overset{O}{\parallel}{C}^+$ )



další generace karbokationtu:

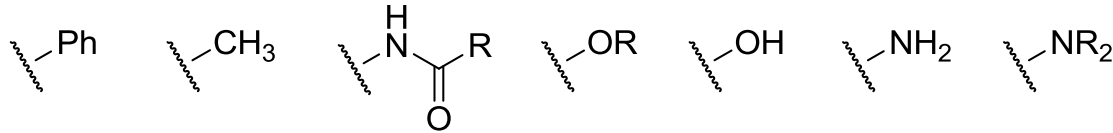


# REGIOSELEKTIVITA $S_EAr$ U SUBSTITUOVANÝCH BENZENŮ



$E^+$

**Aktivující:** zvyšují rychlost  $S_EAr$  ve srovnání s benzenem  
**ortho, para-orientující**



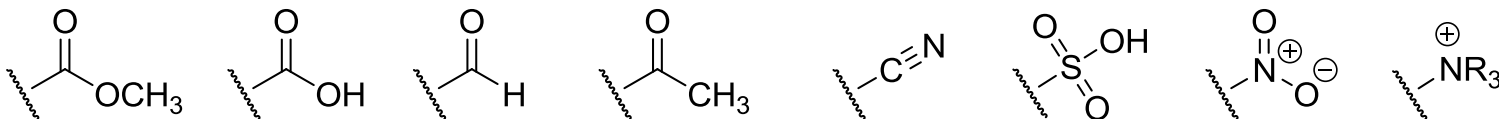
slabě aktivující

silně aktivující

**Deaktivující:** snižují rychlost  $S_EAr$  ve srovnání s benzenem  
**ortho, para-orientující**



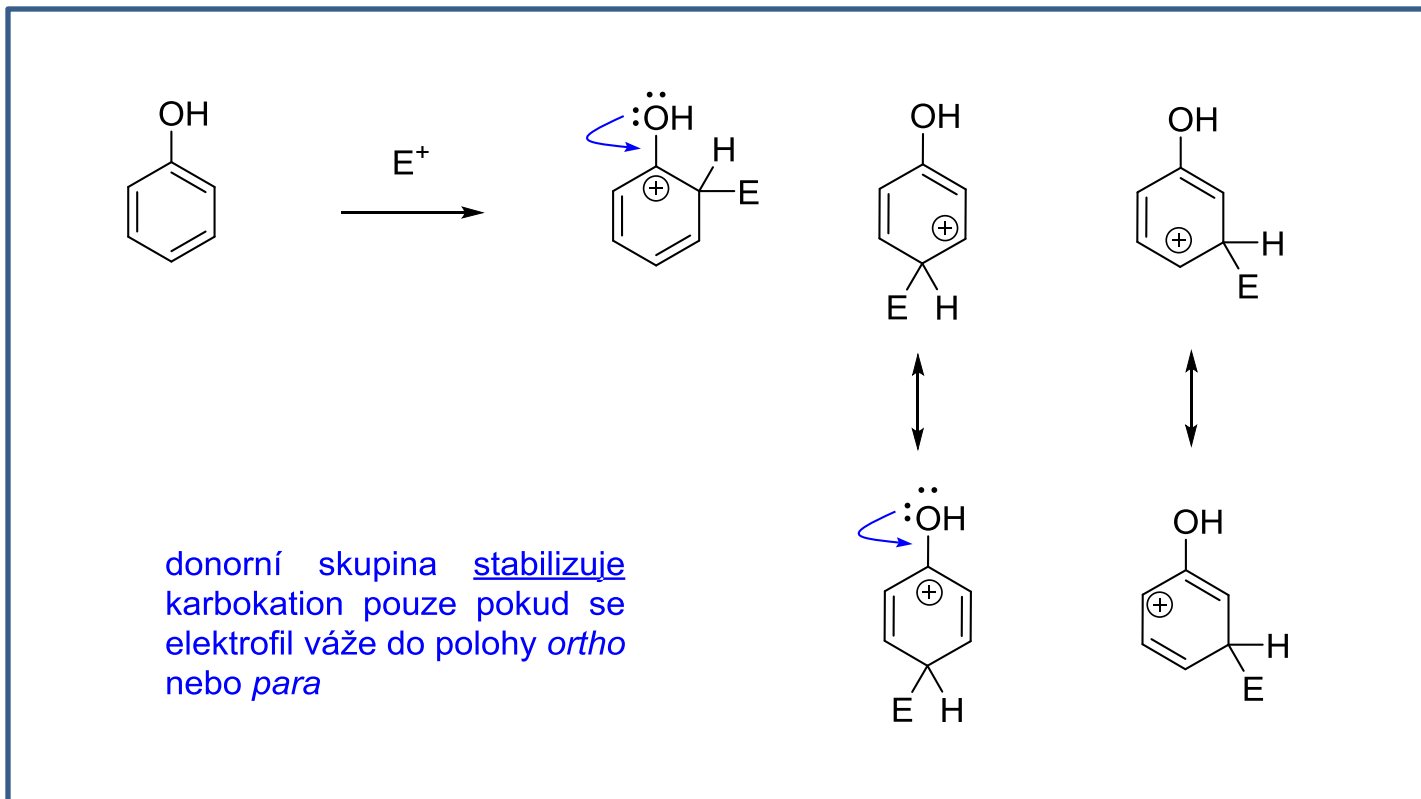
**Deaktivující:** snižují rychlost  $S_EAr$  ve srovnání s benzenem  
**meta-orientující**



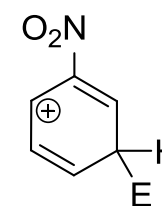
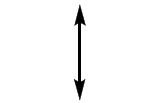
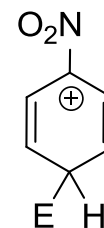
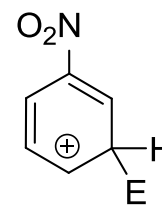
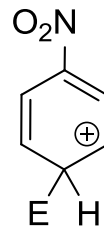
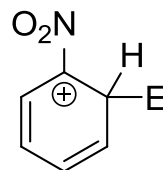
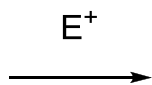
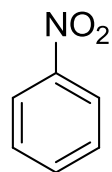
silně deaktivující



# REGIOSELEKTIVITA $S_EAr$ U SUBSTITUOVANÝCH BENZENŮ DONORNÍ SKUPINY



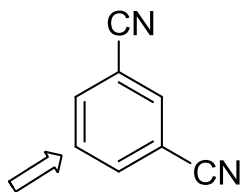
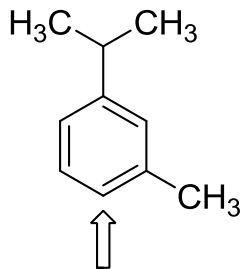
# REGIOSELEKTIVITA S<sub>E</sub>Ar U SUBSTITUOVANÝCH BENZENŮ AKCEPTORNÍ SKUPINY



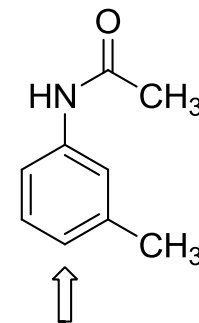
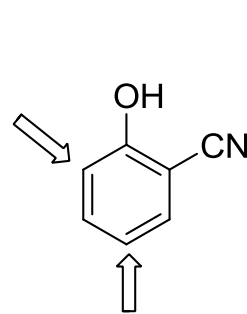
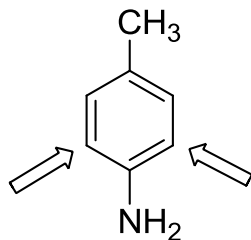
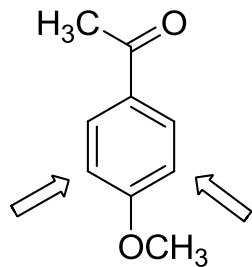
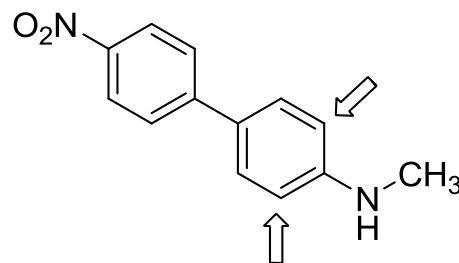
akceptorní skupina destabilizuje  
karbokation pokud se elektrofil  
váže do polohy *ortho* nebo *para* -  
ten proto upřednostní  
polohu *meta*

# REGIOSELEKTIVITA $S_EAr$ U SUBSTITUOVANÝCH BENZENŮ VÍCE SUBSTITUENTŮ

Kam bude útočit elektrofil?

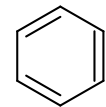
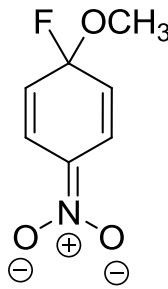
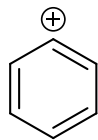


efekt donoru je výraznější

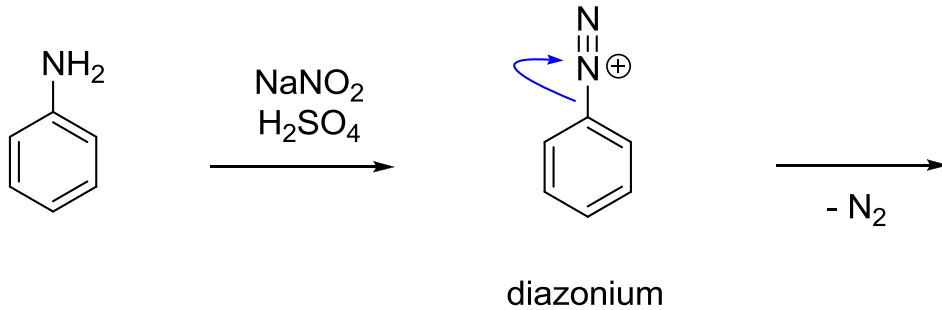
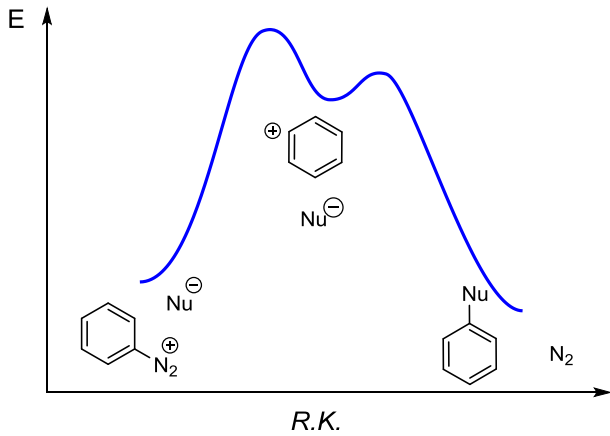


# NUKLEOFILNÍ AROMATICKÁ SUBSTITUCE

$\text{N} \equiv \text{N}^+$

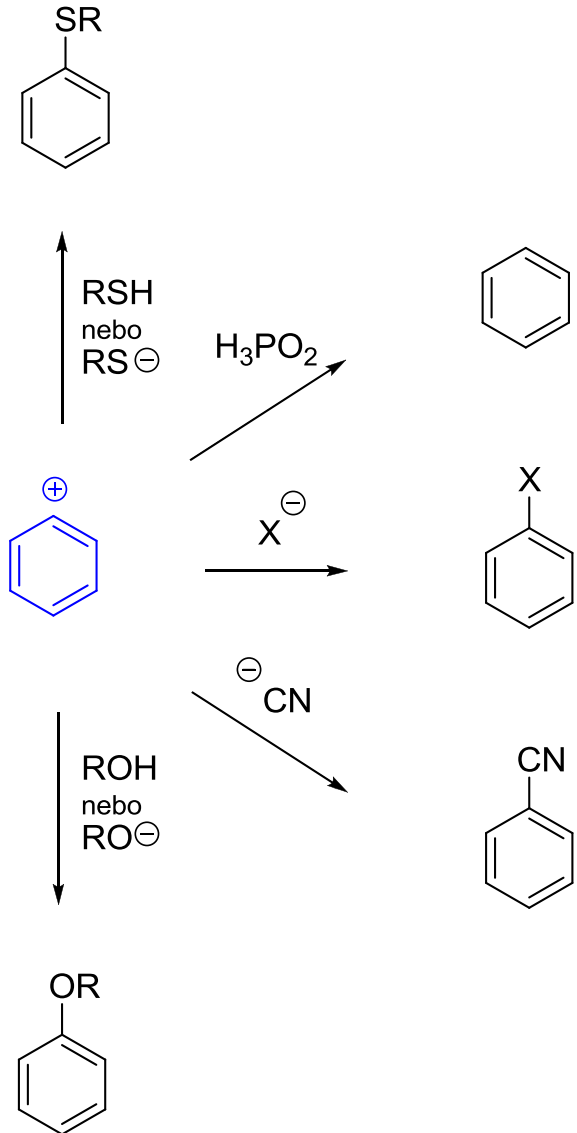


# $S_N1Ar$

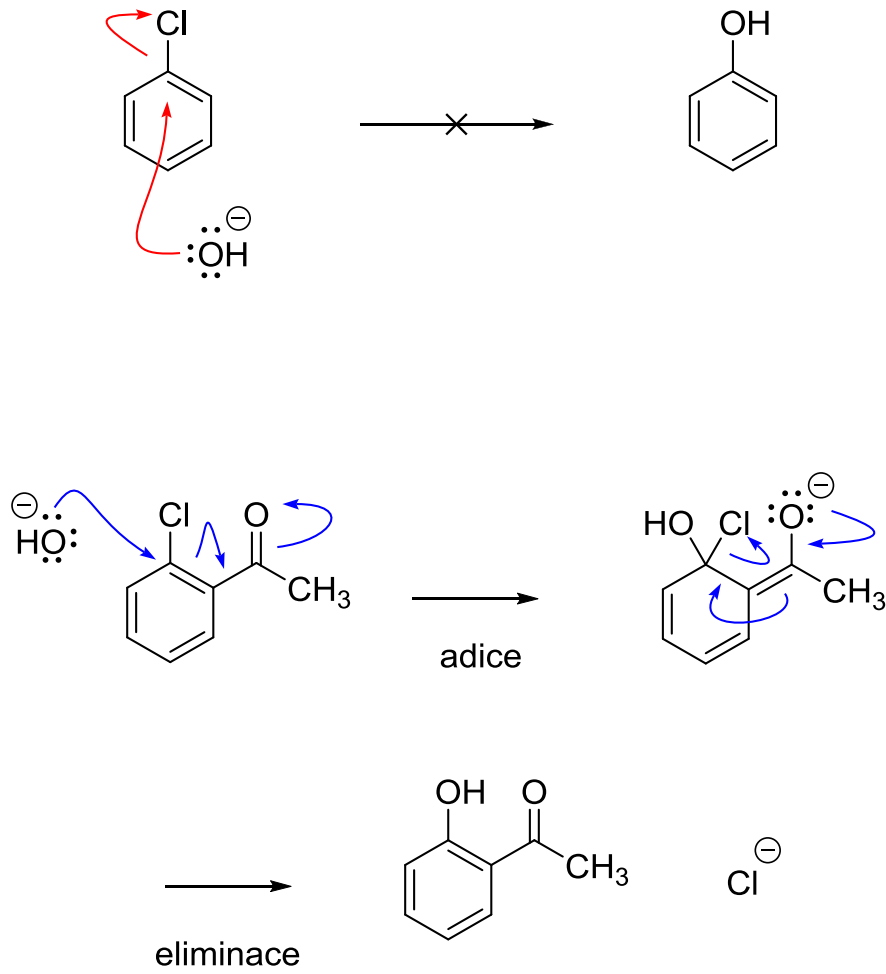


**Sandmeyerova reakce** (radikálový mechanismus):  
zdrojem nukleofilu jsou měďné ( $\text{Cu}^+$ ) soli.

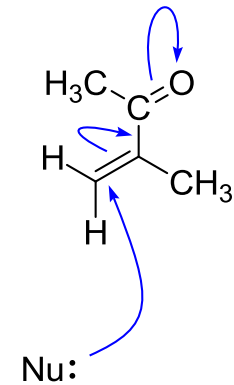
Na podobu produktů to nemá vliv: s  $\text{CuBr}$  zavádíme bromid, s  $\text{CuCN}$  zavádíme kyanid,...



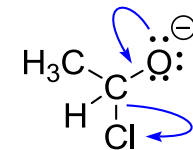
# $S_N2Ar$ Mechanismus Adičně-Eliminační



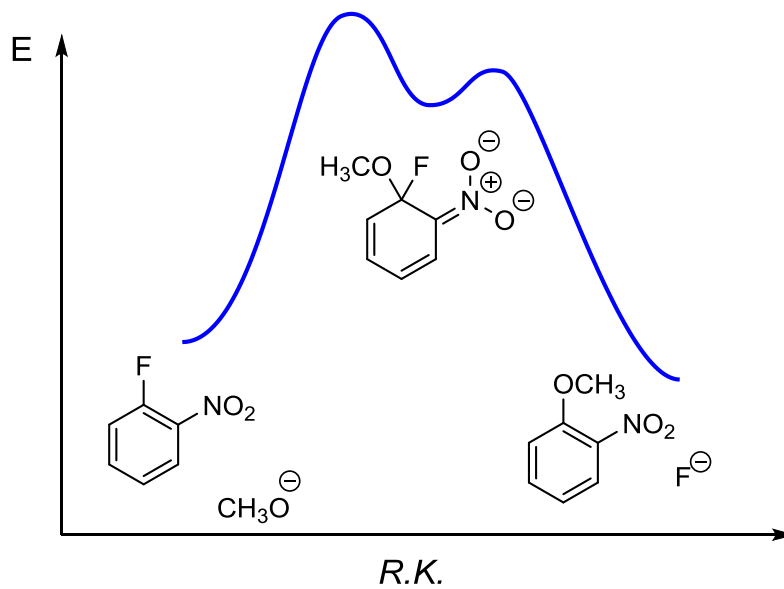
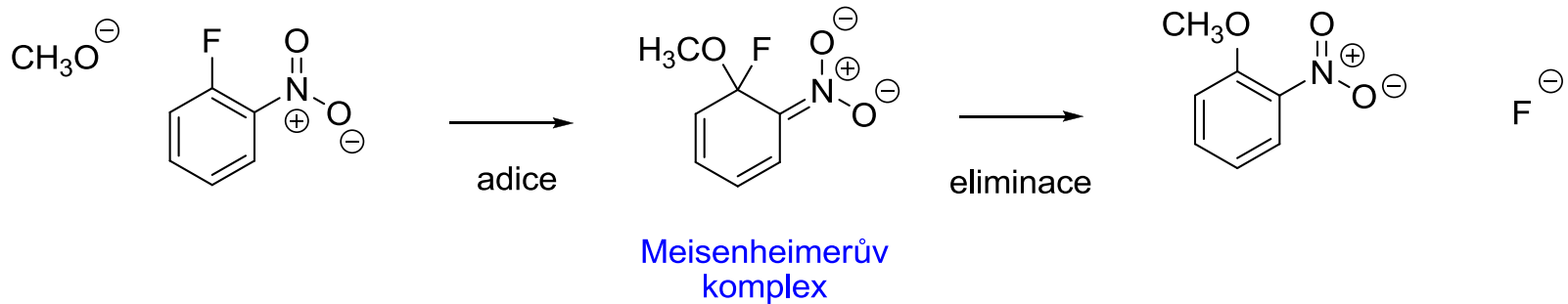
$\alpha, \beta$ -**NENASYCENÝ  
KARBONYL**  
**1,4-adice**



**chlorid kyseliny**  
**nukleofilní substituce**  
**na karbonylu**

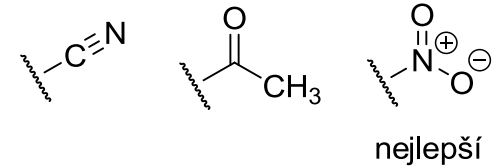


# $S_N2Ar$ Mechanismus Adičně-Eliminační

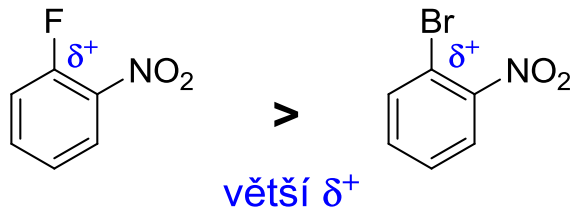


# $S_N2Ar$ Mechanismus Adičně-Eliminační

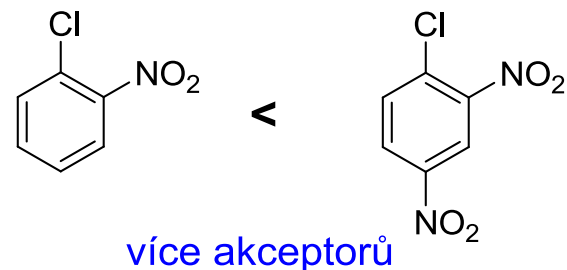
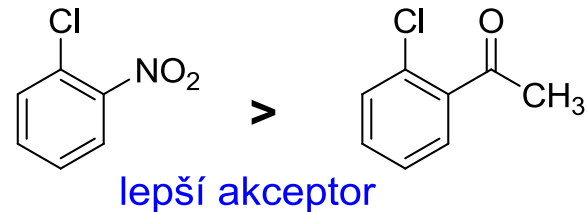
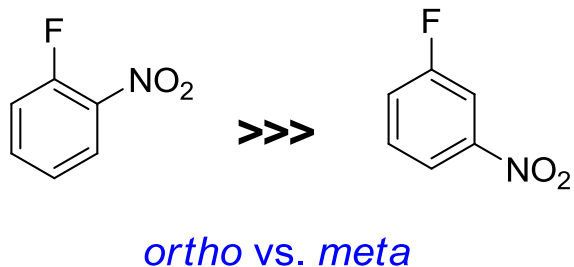
- vyžaduje přítomnost akceptorních skupin v *ortho* nebo *para* poloze (vůči odstupující skupině), nejlépe v obou
- vyžaduje přítomnost odstupující skupiny



## Větší rychlost?

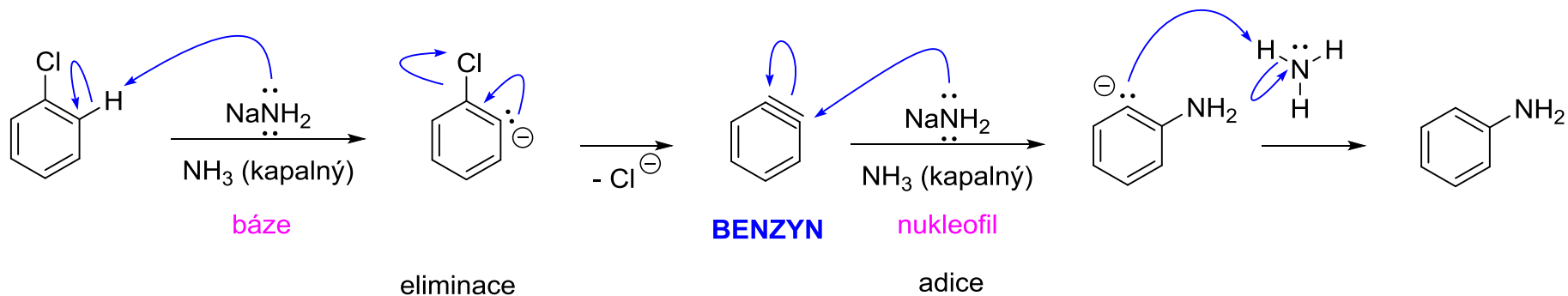


odstoupení LG není rychlost určující krok  
==> kvalita LG nehraje roli

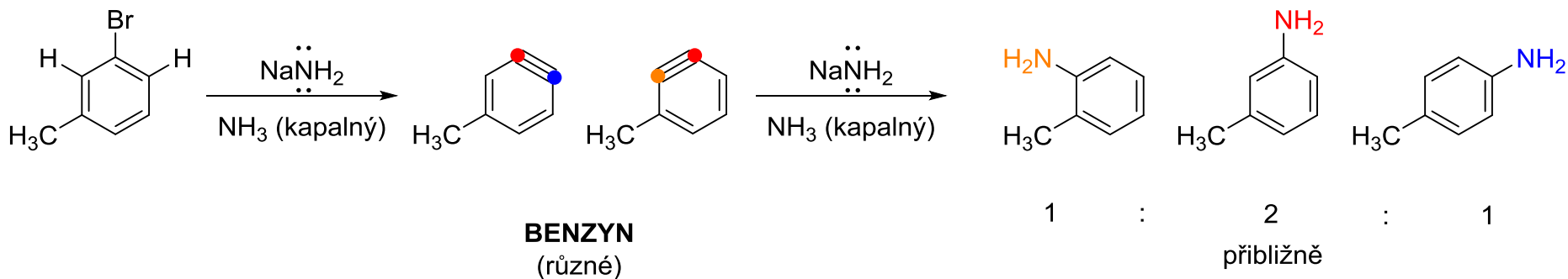
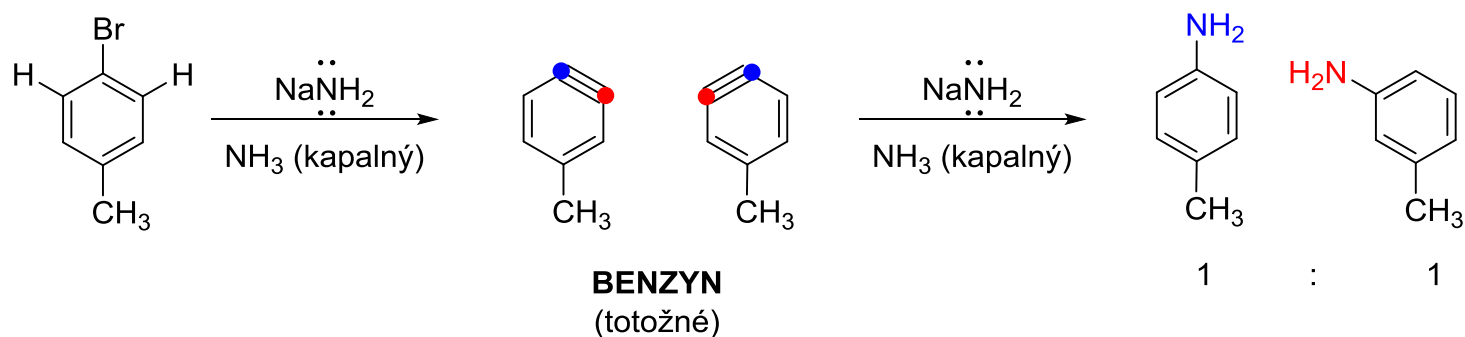




# Benzynový mechanismus Mechanismus Eliminačně-Adiční



## Regioselektivita reakce:



# Benzynový mechanismus

## Mechanismus Eliminačně-Adiční

**Regioselektivita reakce, akceptorní skupina:**

