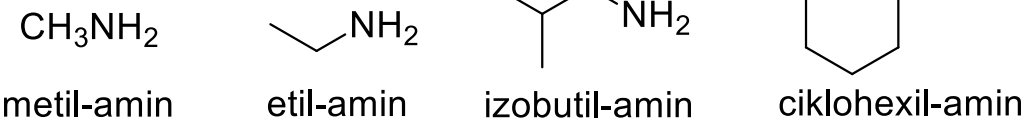
AMINOK

Elnevezés

általános név: alkil-amin (dialkil-amin, trialkil-amin)
előtagként: aminocsoport (NH_2)

Primer aminok

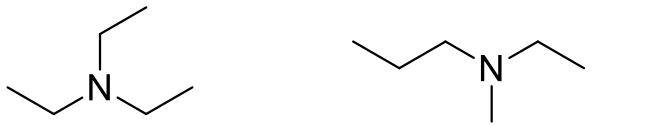


metil-amin | etil-amin | izobutil-amin | ciklohexil-amin

Szekunder aminok

dietil-amin | etil-metil-amin

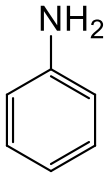
Tercier aminok



trietil-amin | etil-meti-propil-amin

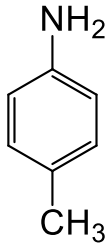
2-amino-etanol | 3-amino-propionsav

Aril-aminok

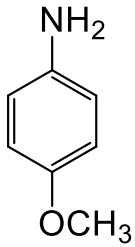


anilin

N-metil-anilin

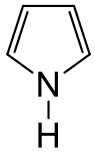


p-toluidin

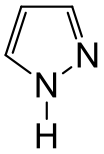


p-anizidin

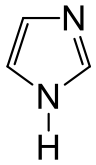
Heterociklusos aminok



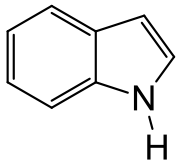
pirrol
(azol)



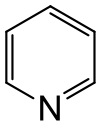
pirazol
(1,2-diazol)



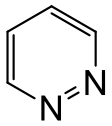
imidazol
(1,3-diazol)



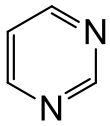
indol



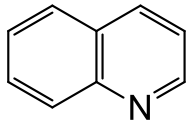
piridin
(azin)



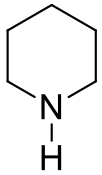
piridazin
(1,2-diazin)



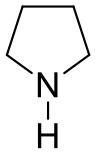
pirimidin
1,3-diazin)



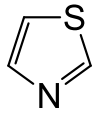
kinolin



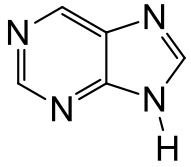
piperidin



pirrolidin



tiazol

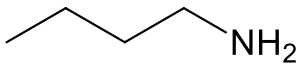


purin

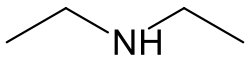
Fizikai tulajdonságok

Forráspont

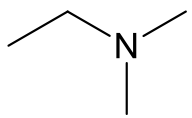
CH_3CH_3	CH_3NH_2	CH_3OH
etán	metil-amin	metanol
-89 °C	-6 °C	65 °C



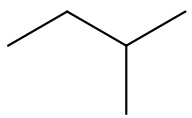
butil-amin
78 °C



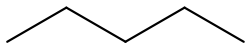
dietil-amin
56 °C



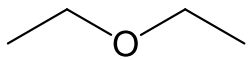
etil-dimetil-amin
38 °C



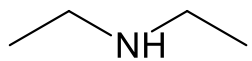
izopentán
28 °C



pentán
36 °C

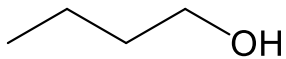


dietil-éter
38 °C



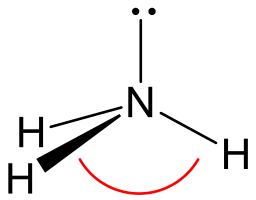
dietil-amin
56 °C

butil-amin
78 °C



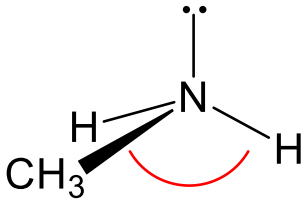
butanol
117 °C

Az aminok szerkezete



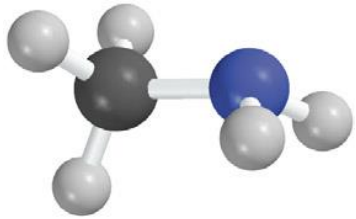
107°

ammónia



112°

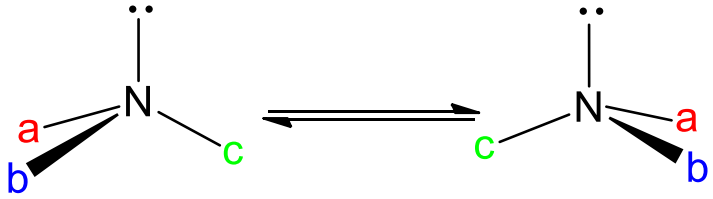
metil-amin



térszerkezet: trigonális piramis

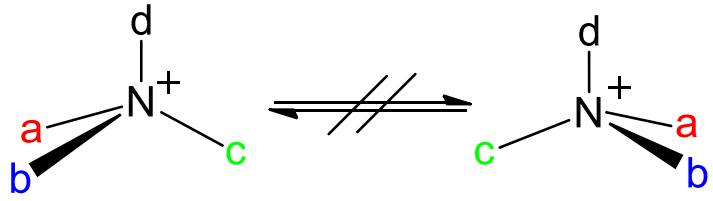
Királis aminok

tercier amin



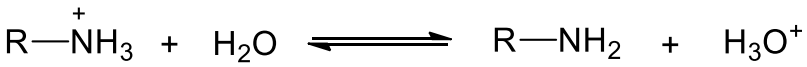
gyors racemizáció

kvaterner ammóniumsó



rezolválható

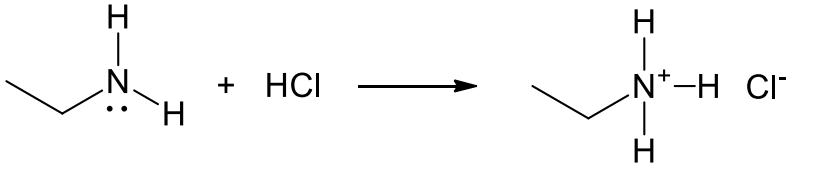
Az aminok bázicitása



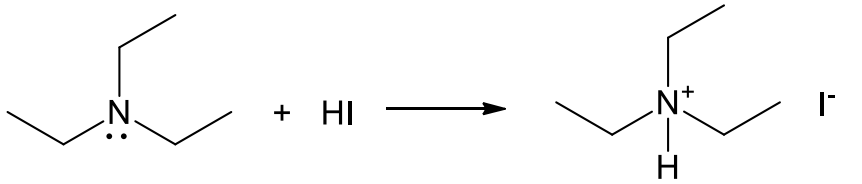
$$K_s = \frac{[R\text{-}NH_2]\,[H_3O^+]}{[R\text{-}NH_3^+]} \qquad pK_s = -\lg K_s$$

	NH_4^+	$CH_3—NH_3^+$	$CH_3CH_2—NH_3^+$
pK_s	**9,26**	**10,64**	**10,75**

Aminok reakciói savakkal

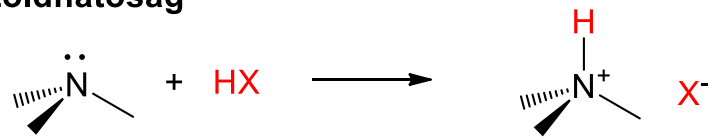


etil-ammónium-klorid



trietil-ammónium-jodid

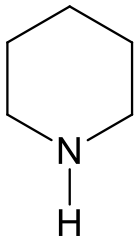
Vízoldhatóság

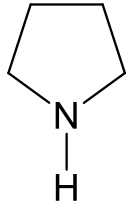


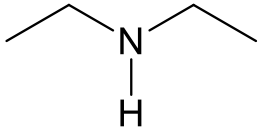
vízben nem oldódó amin

vízoldható ammóniumsó

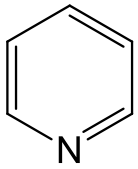
Heterociklusos aminok bázicitása

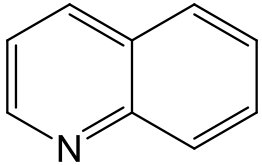


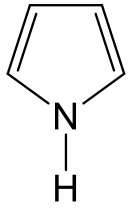




pK_s (ammóniumion)	11,20	11,11	10,98

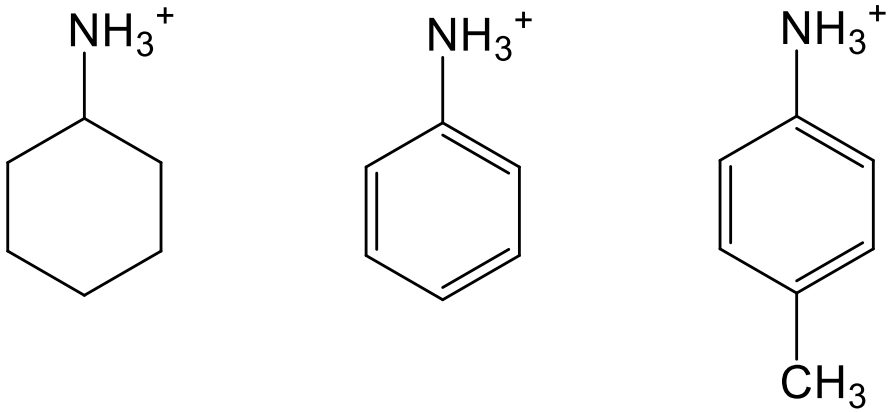






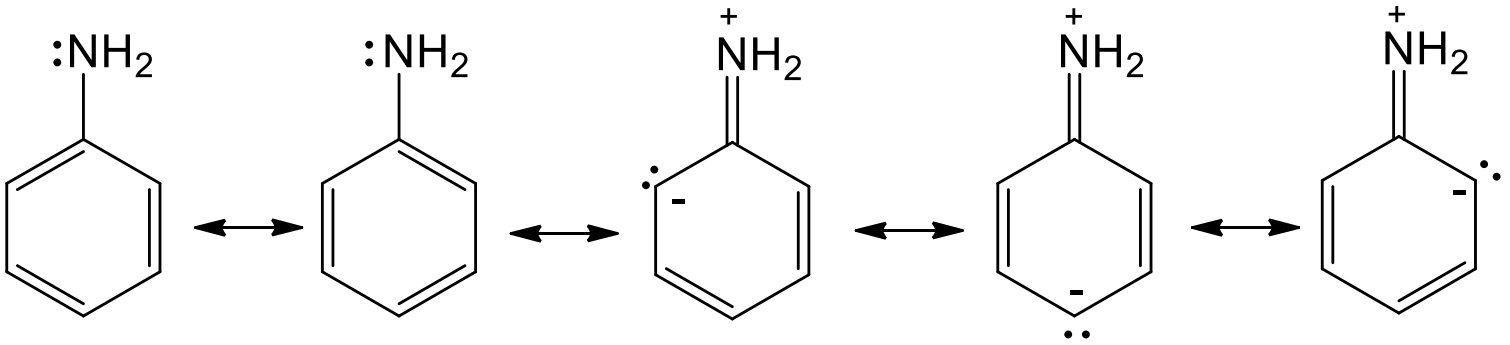
pK_s (ammóniumion)	5,23	4,50	a N-atom nem bázikus

Az aril-aminok bázicitása

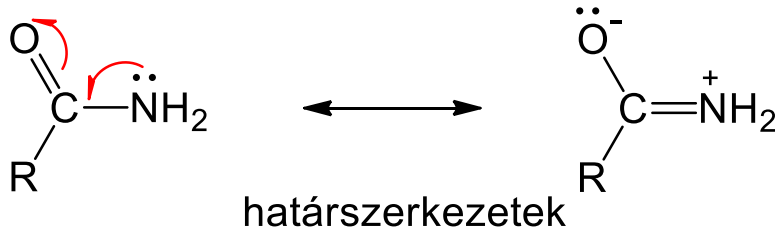


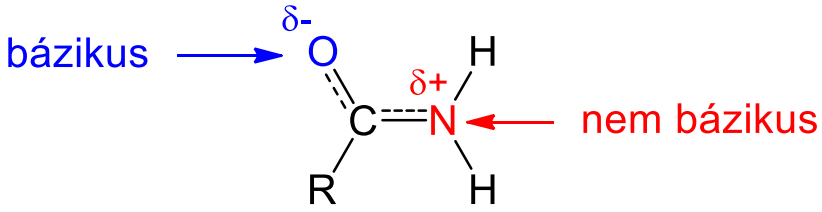
pK_s	**10,64**	**4,58**	**5,08**

delokalizált elektronrendszer



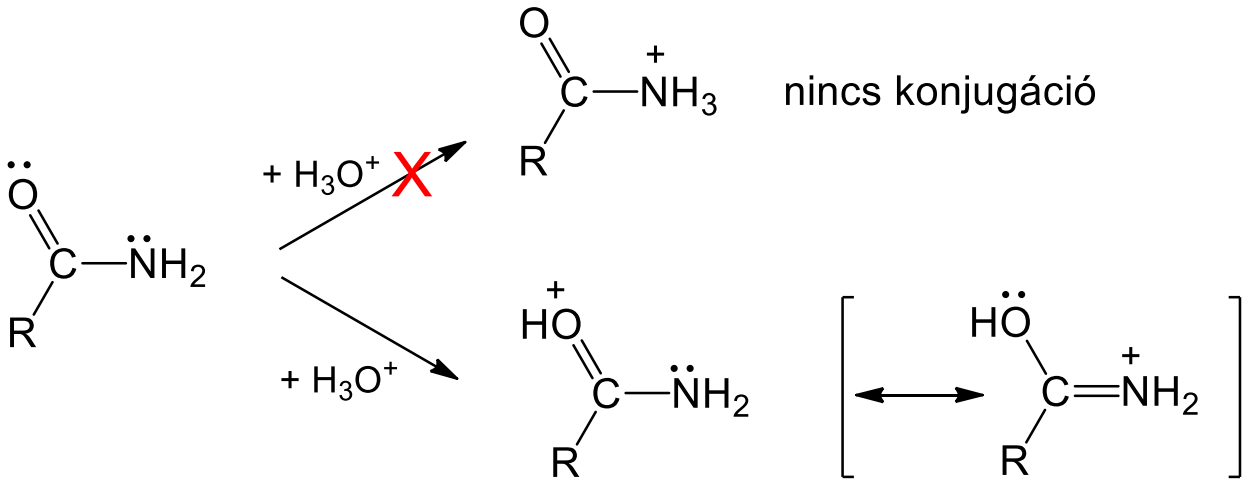
Az amidok szerkezete



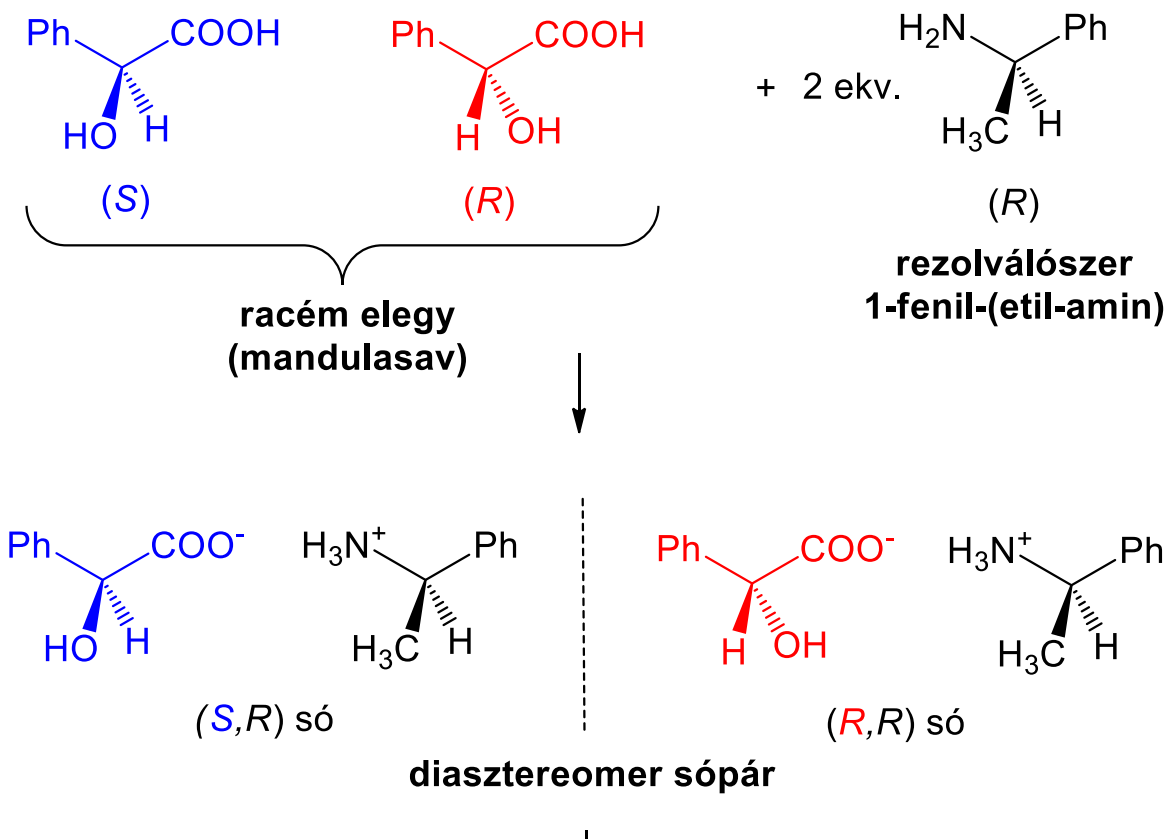


6 atom egy síkban

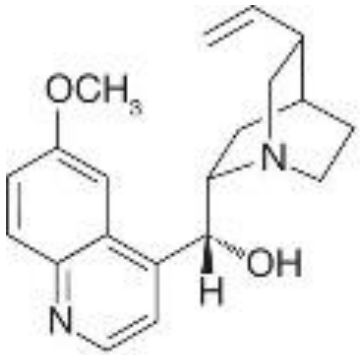
Az amidok bázicitása



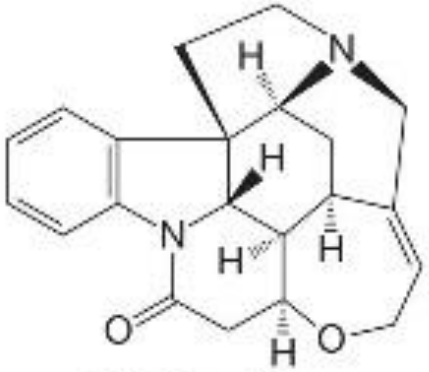
Aminok alkalmazása rezolválószerként



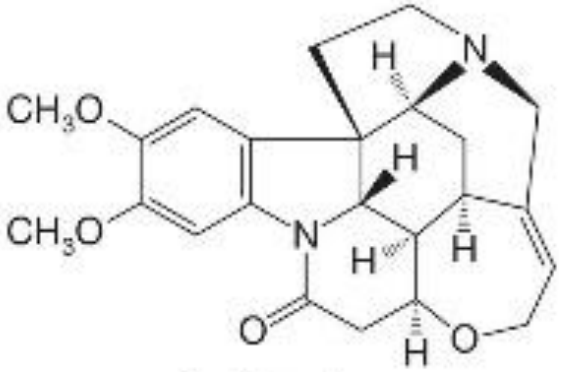
Természetes rezolválóbázisok



(−)-Quinine



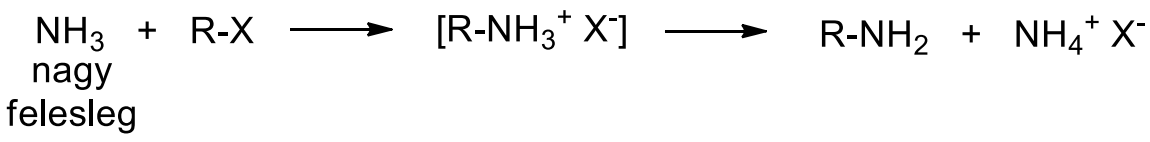
(−)-Strychnine

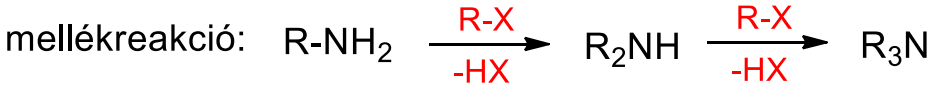


(−)-Brucine

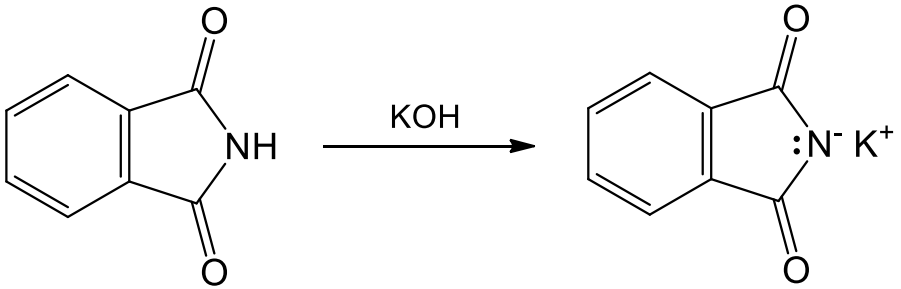
Az aminok előállítása

Az ammónia alkilezése (S_N reakció)



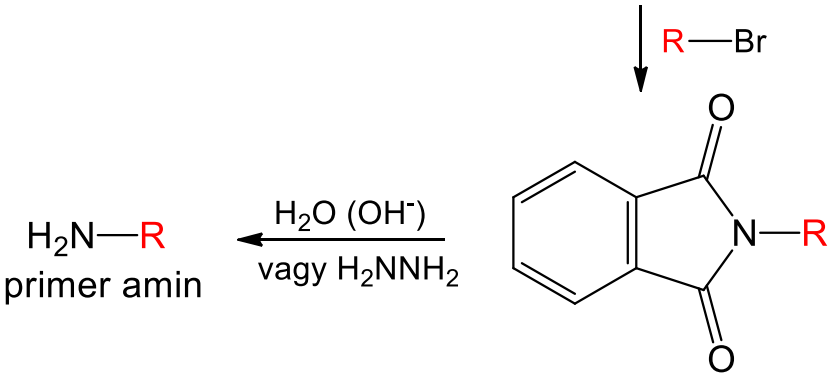


Primer aminok előállítása (Gabriel szintézis)



ftálimid

ftálimid-kálium

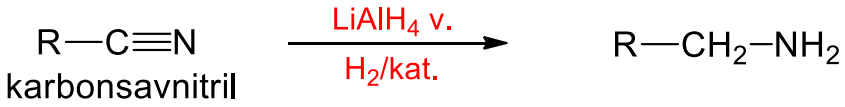


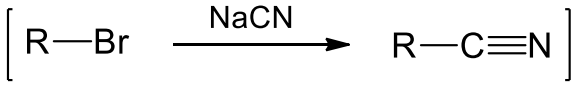
primer amin

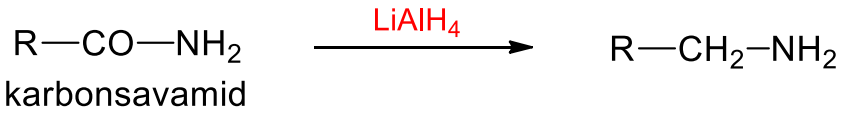
N-alkil-ftálimid

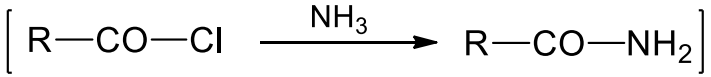
Aminok előállítása redukciós módszerekkel

karbonsavszármazékok redukciója









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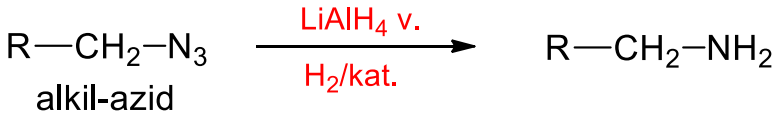

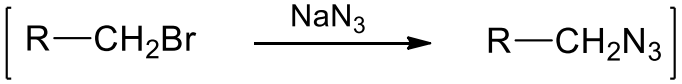

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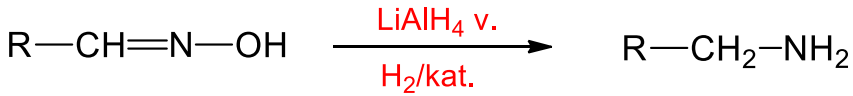
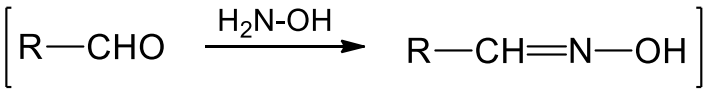
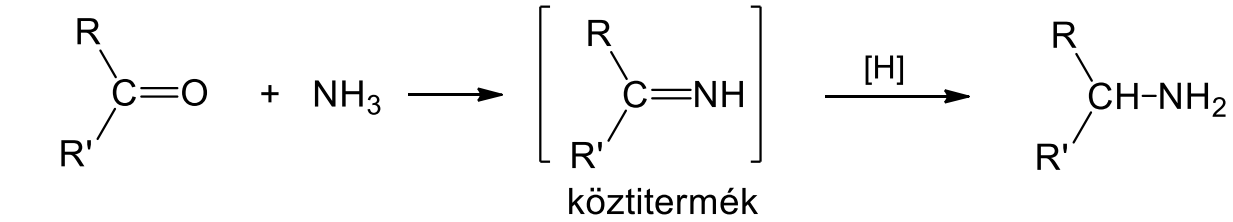
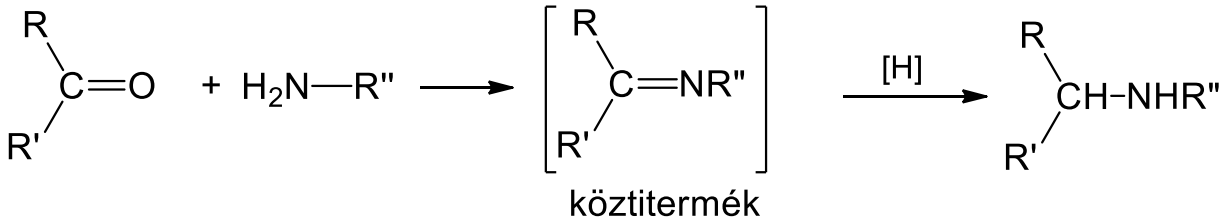


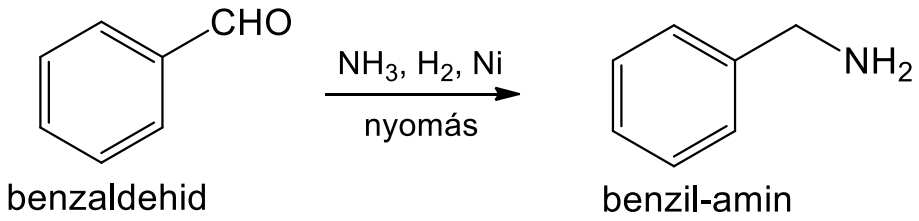


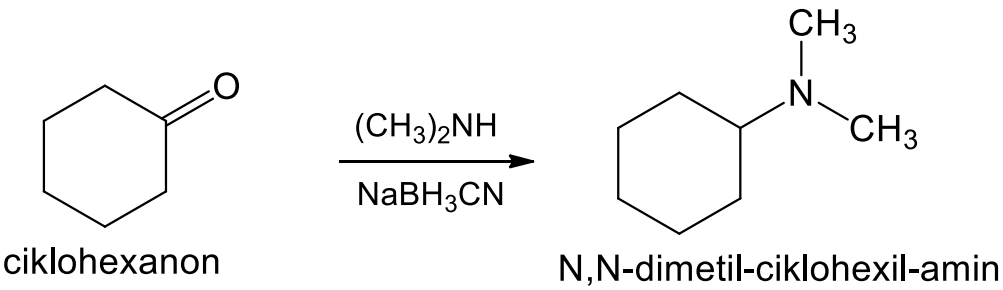
Oxovegyületek reduktív aminálása



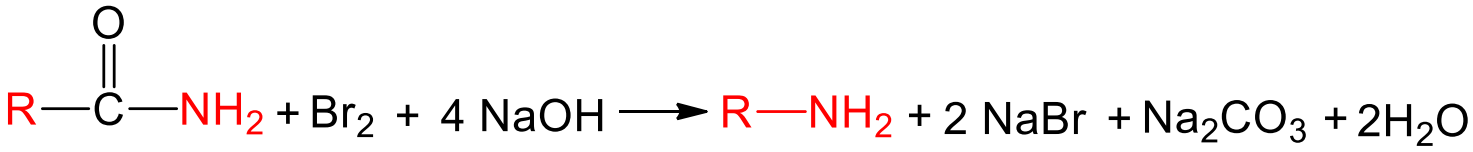


Példák





Hofmann-lebontás



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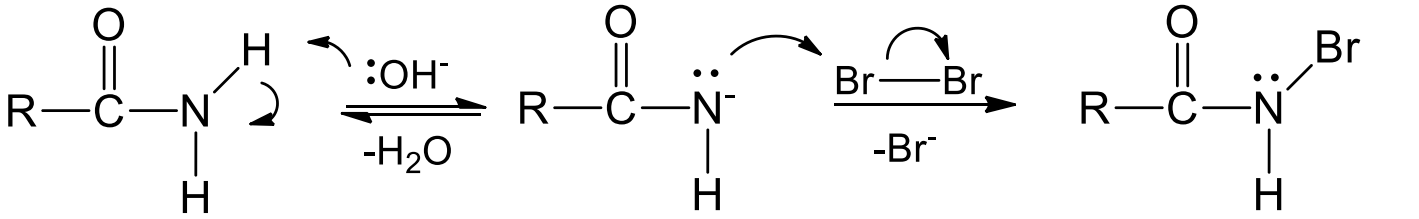
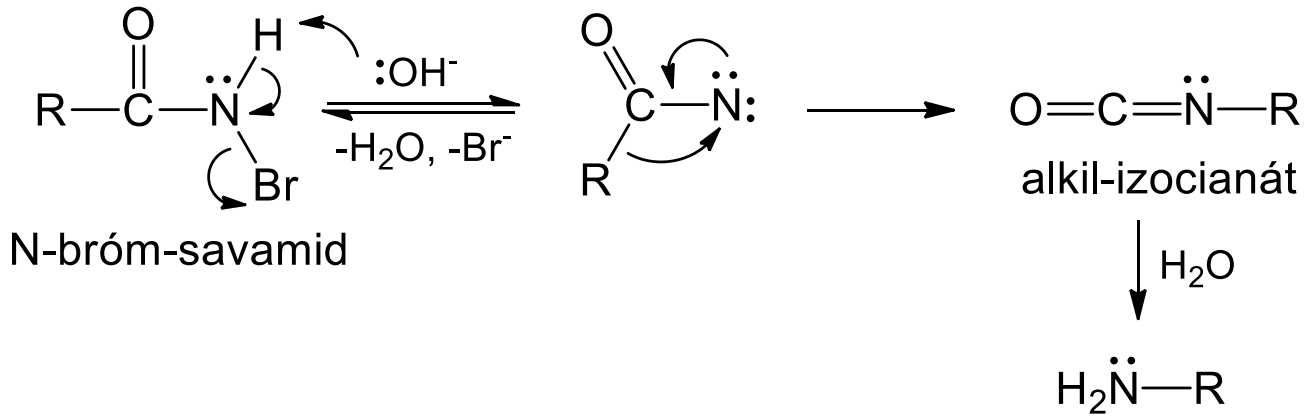
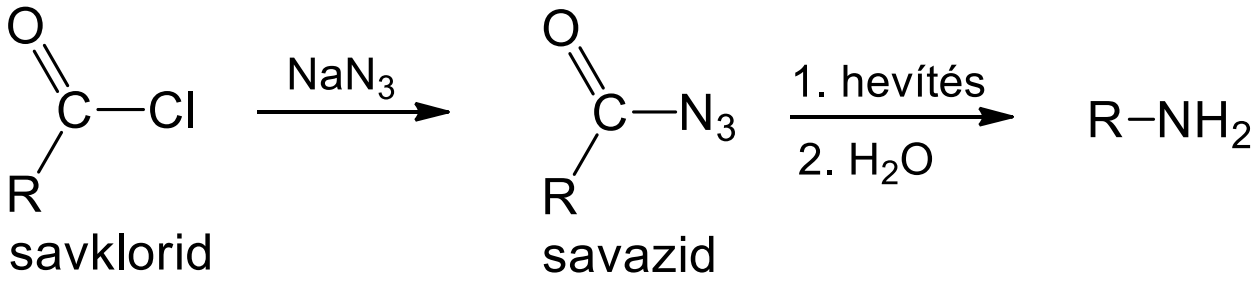
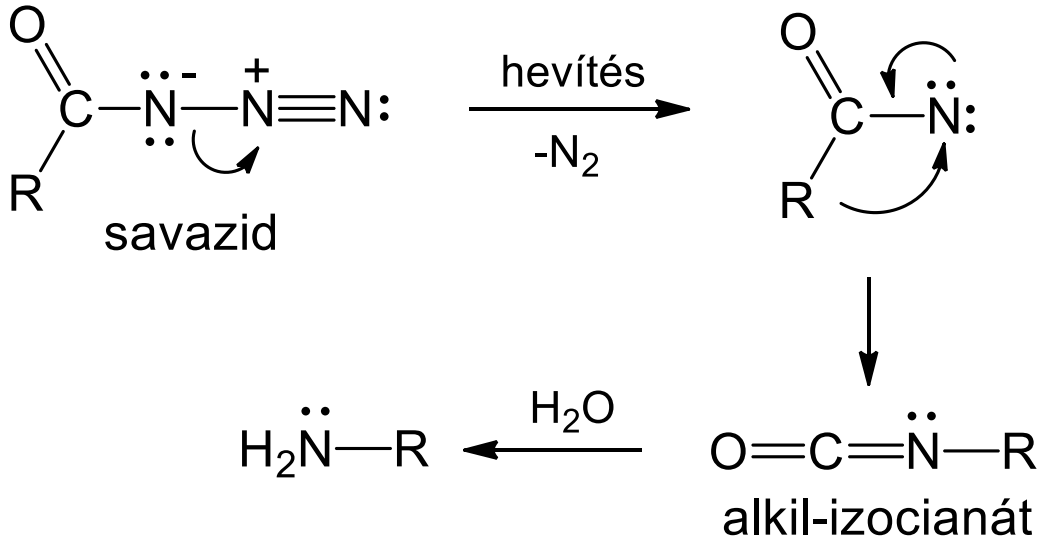




Curtius-lebontás



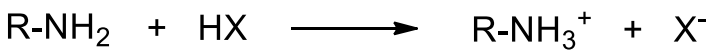
Mechanizmus



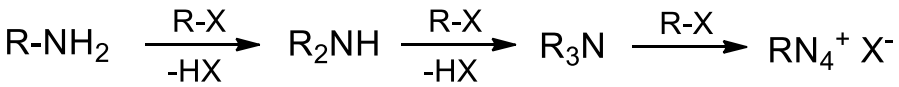
AZ AMINOK KÉMIAI TULAJDONSÁGAI

Korábban tárgyalt reakciók

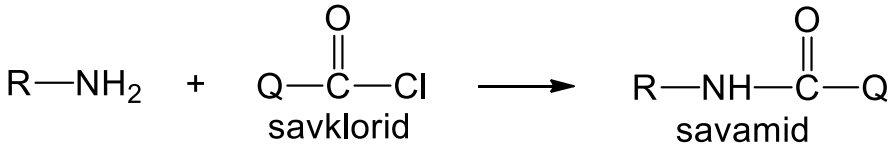
Sav-bázis reakciók



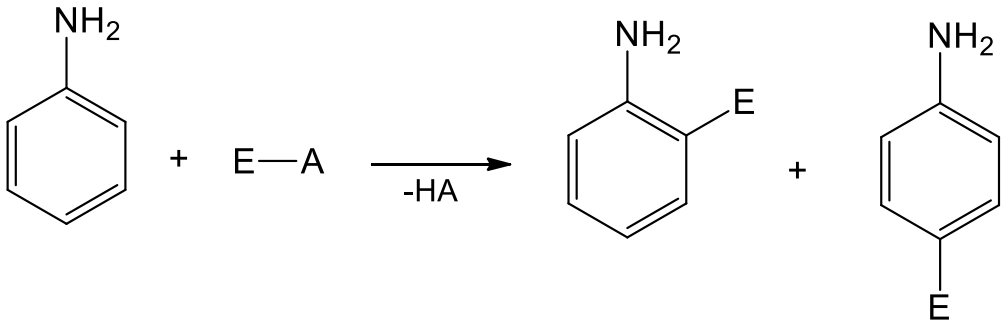
Alkilezés



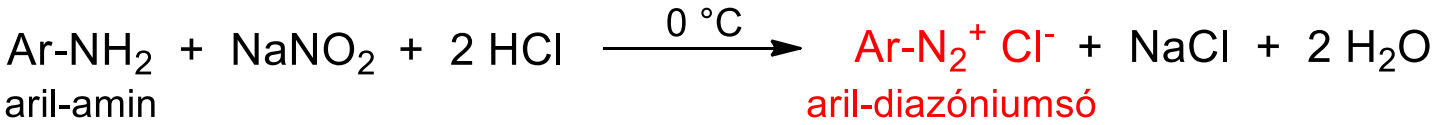
Acilezés

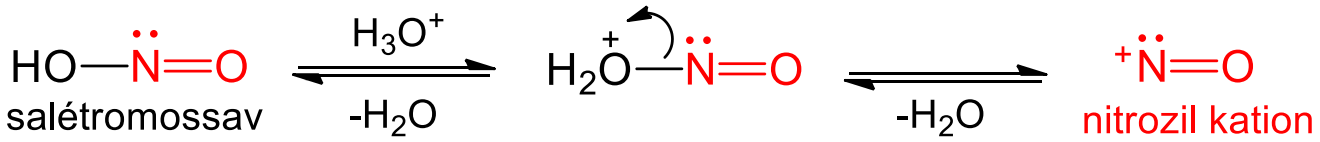


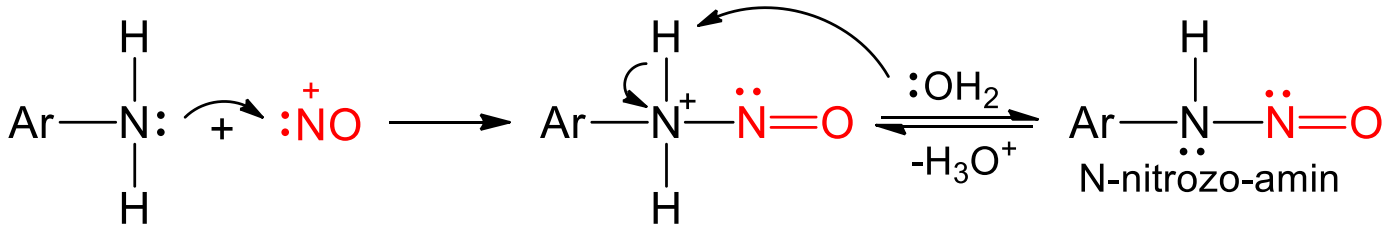
Aromás aminok elektrofil szubsztitúciója

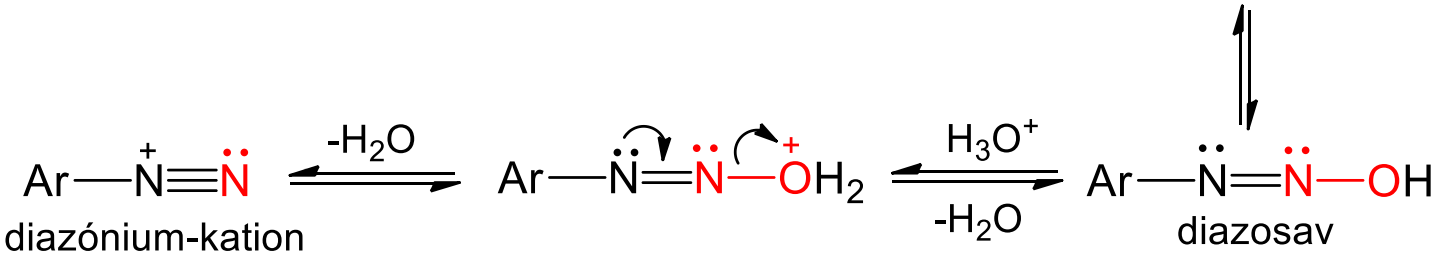


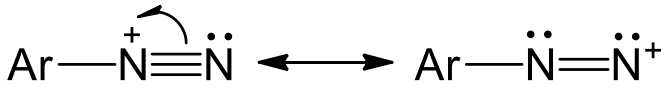
Aromás aminok reakciója salétromossavval (diazotálás)











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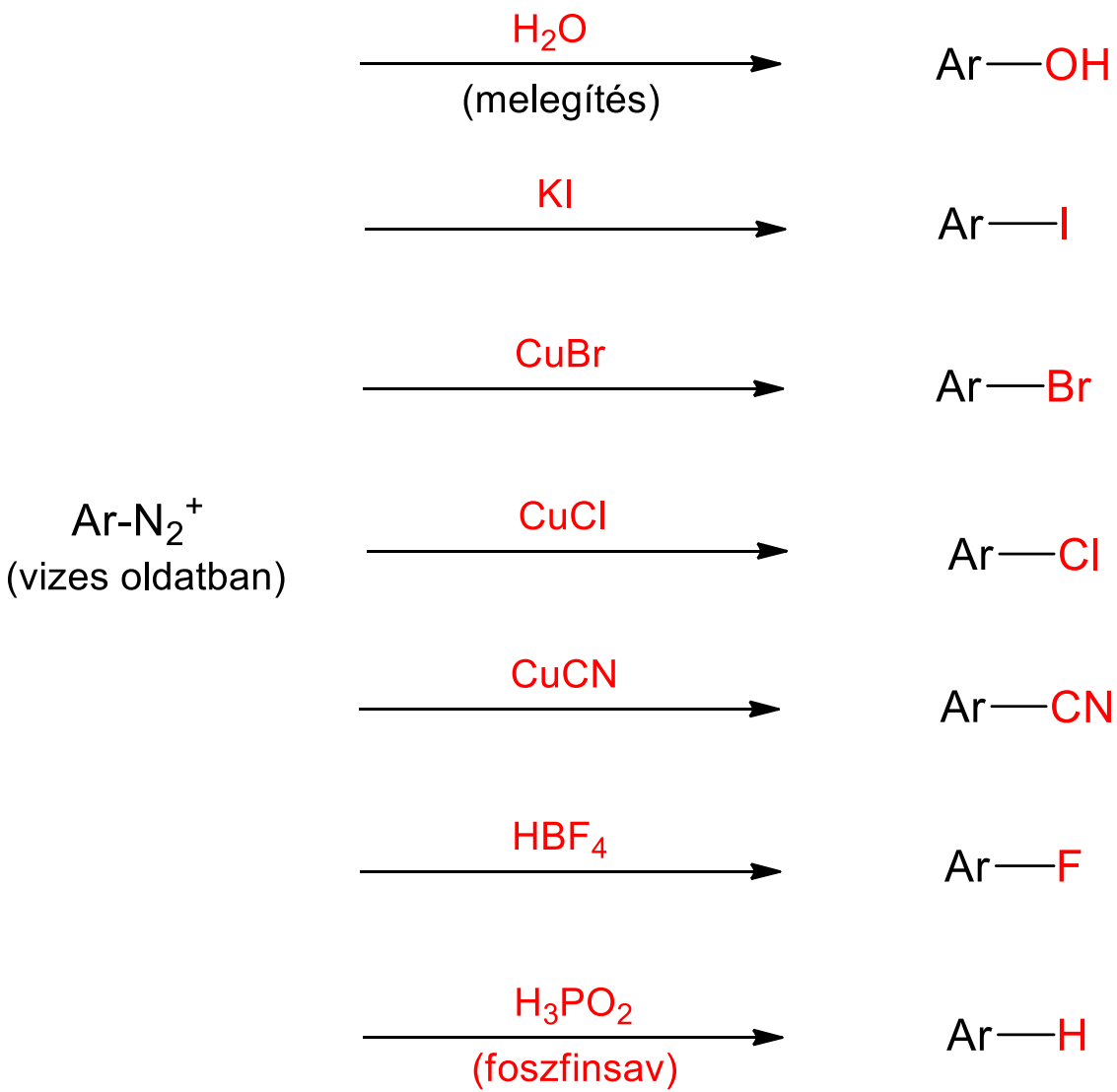
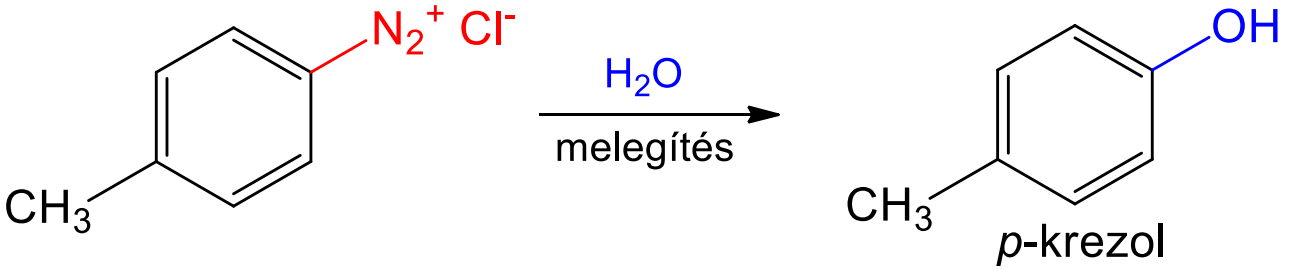
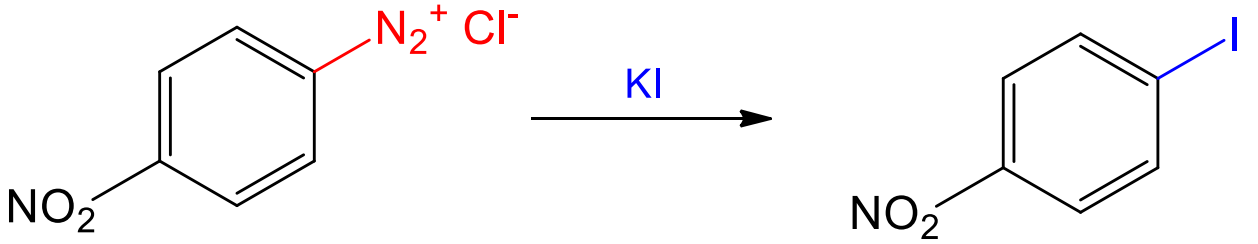


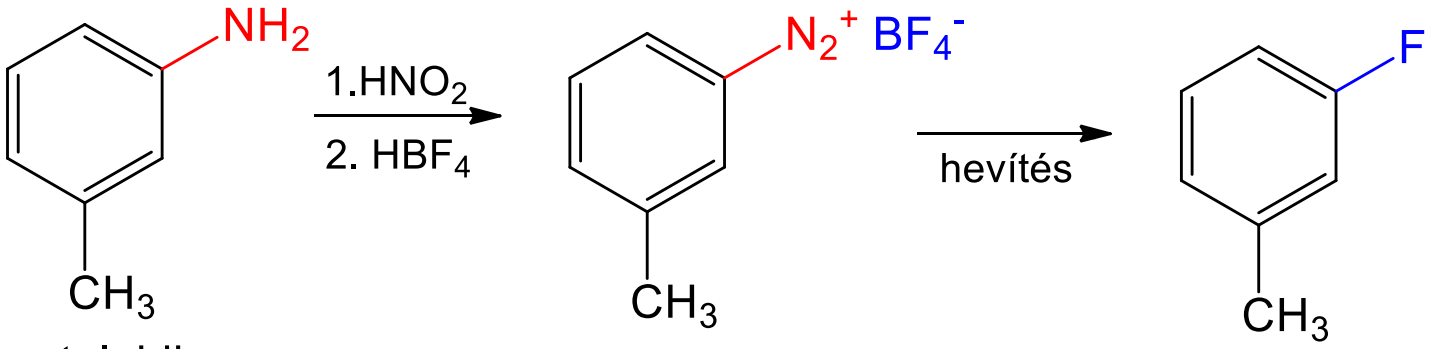
Példák



p-krezol



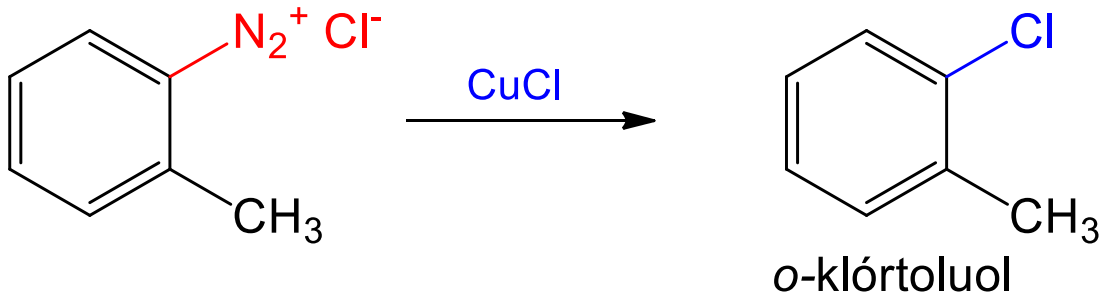
p-jód-nitrobenzol



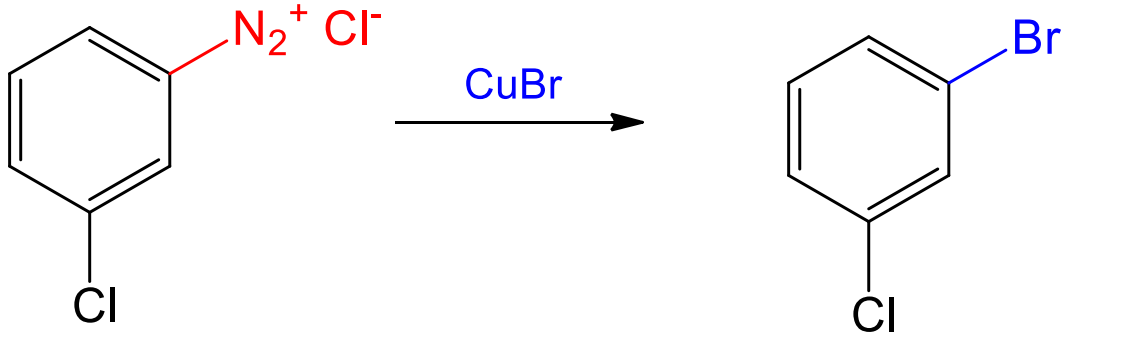
m-toluidin

m-fluortoluol

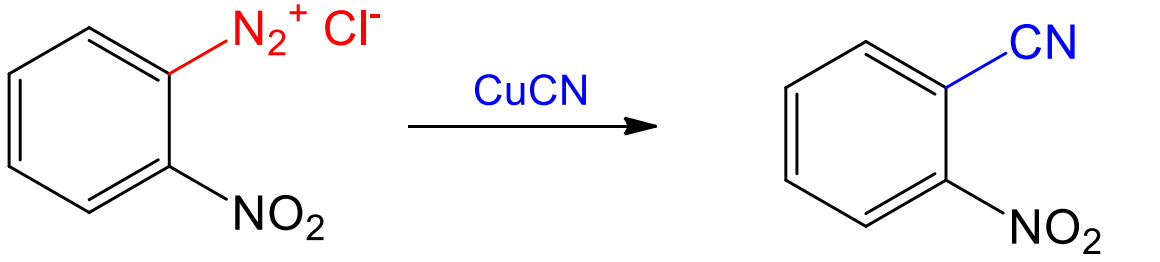
Sandmeyer-reakciók



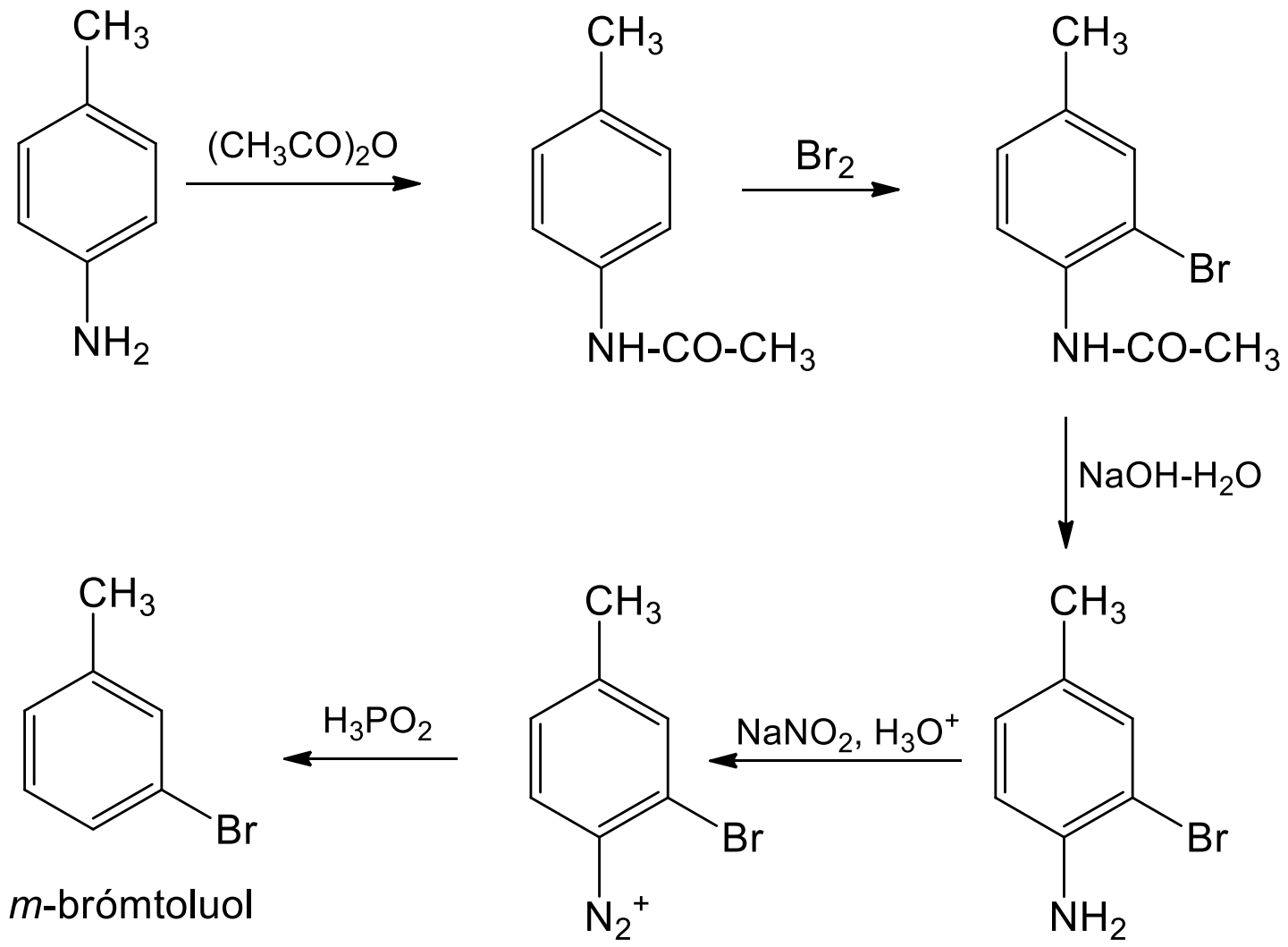
o-klórtoluol



m-bróm-klórbenzol

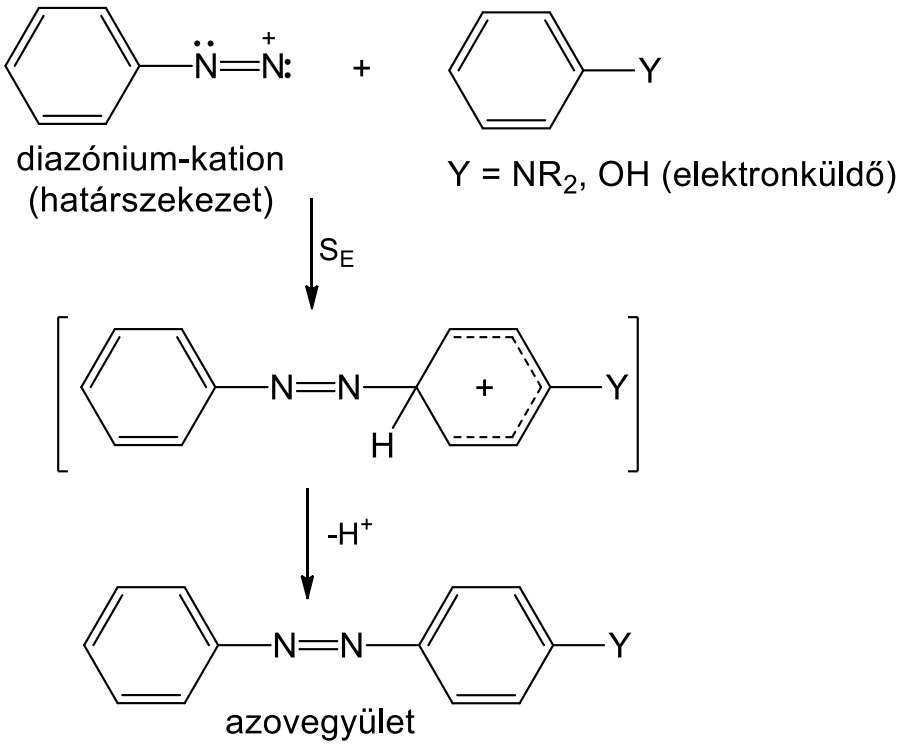


o-nitro-benzonitril

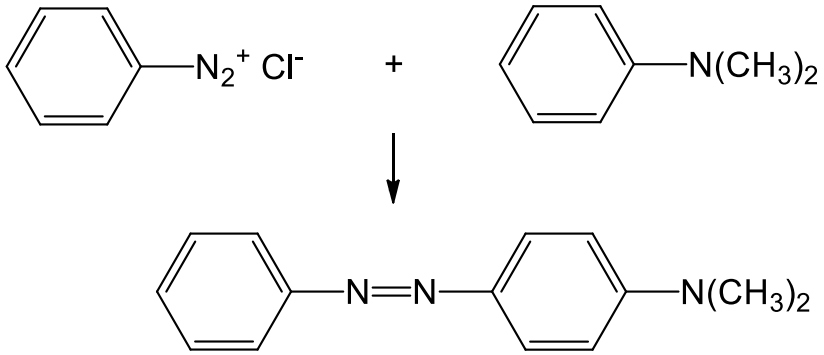


m-brómtoluol

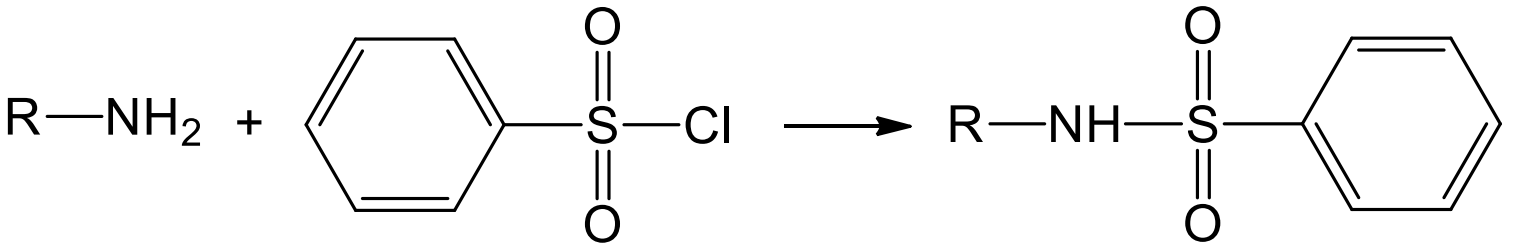
A diazóniumsók kapcsolási reakciói (azokapcsolás)

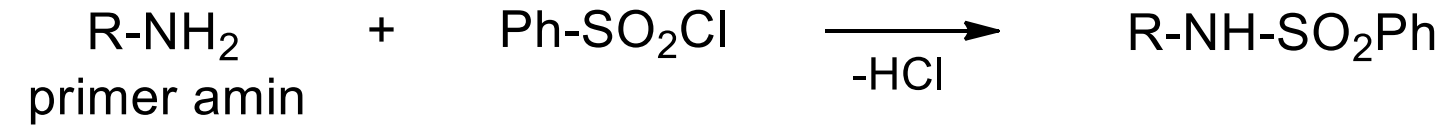


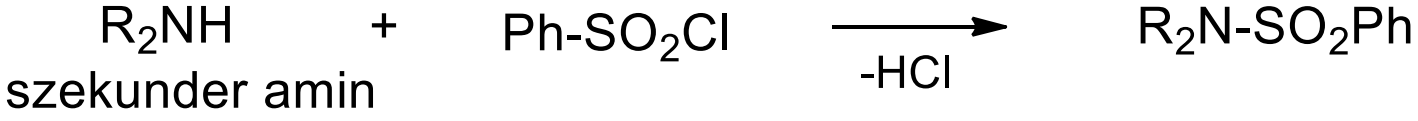
Példa



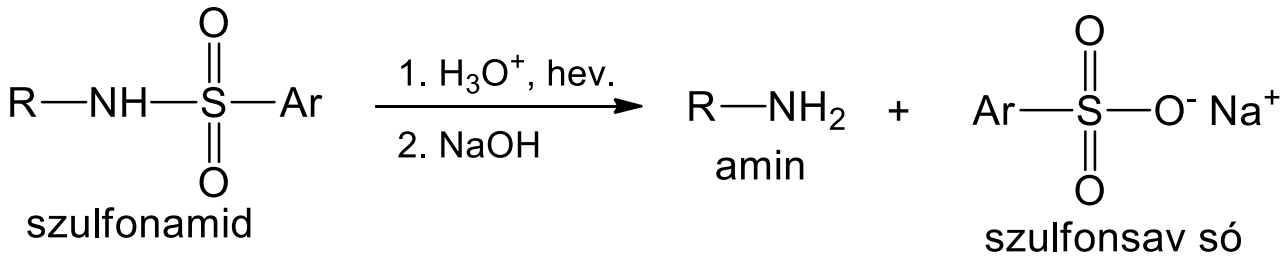
Az aminok reakciója szulfonil-kloridokkal



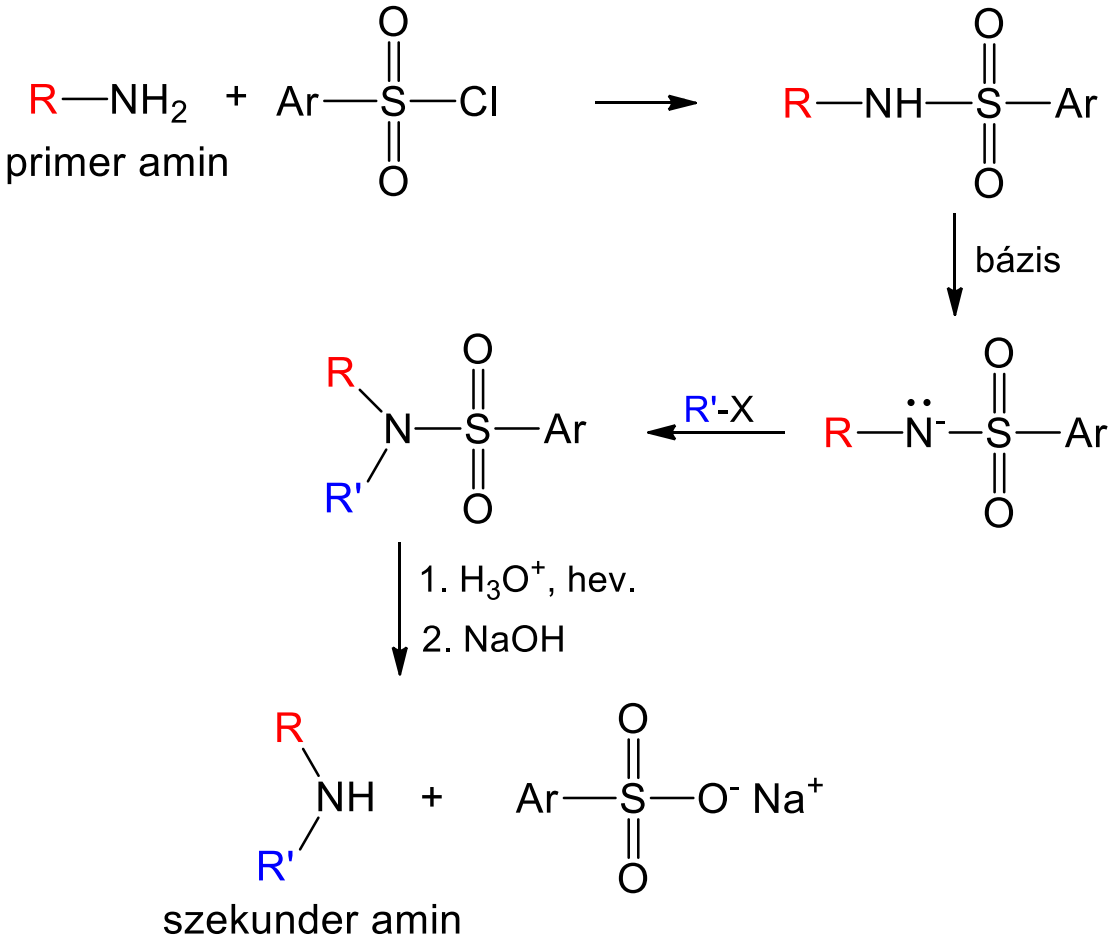




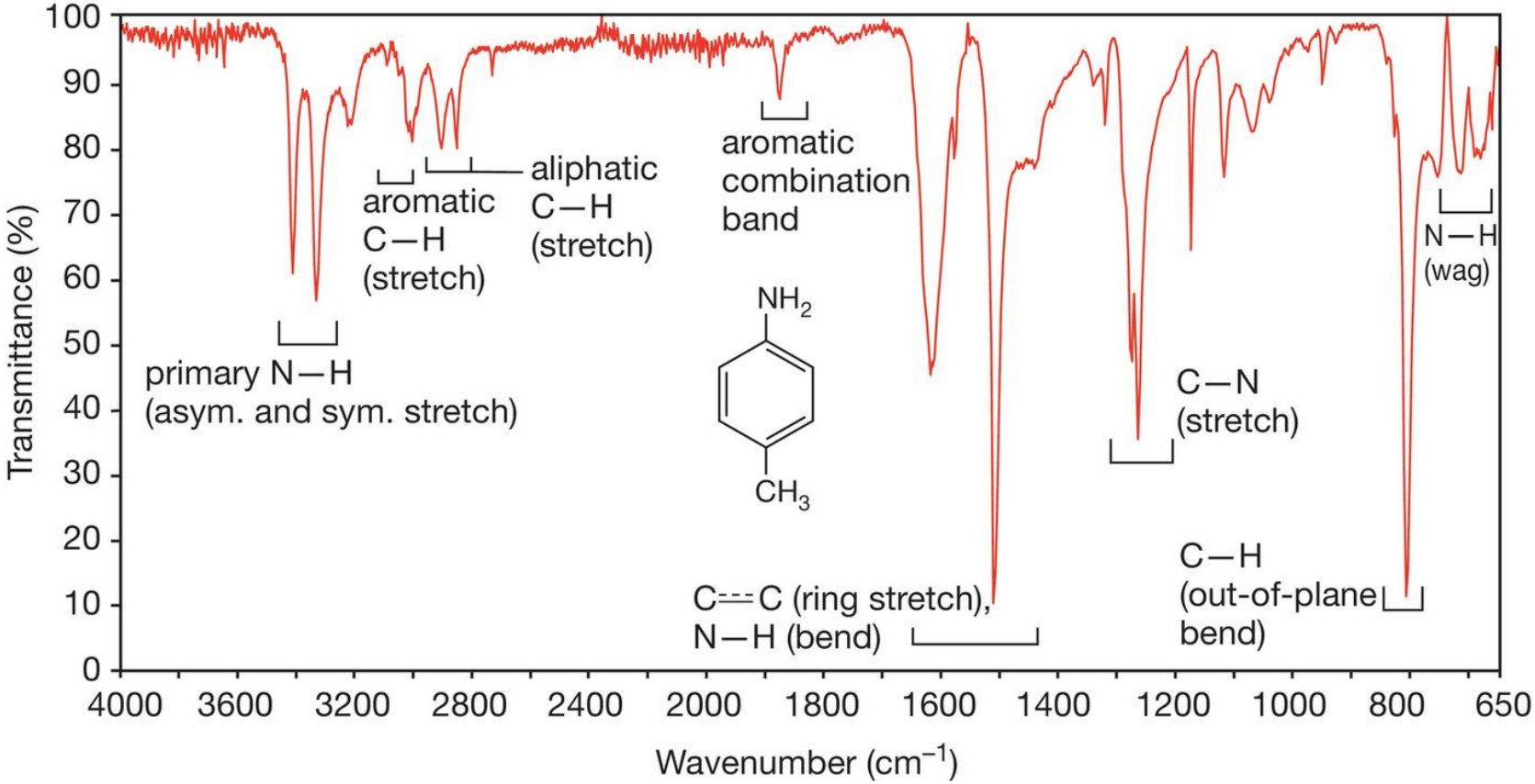
A szulfonamidok hidrolízise



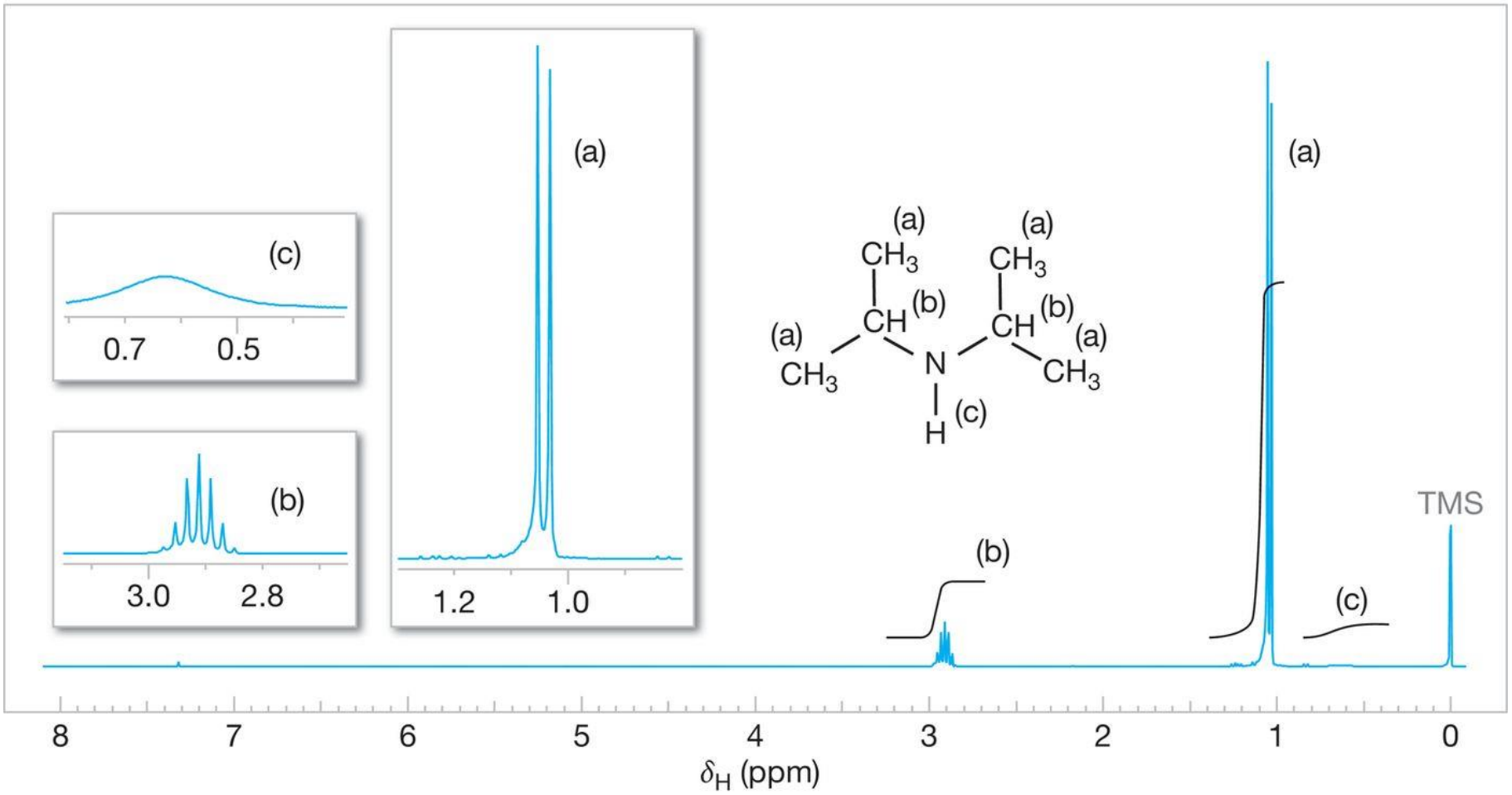
Szekunder aminok előállítása



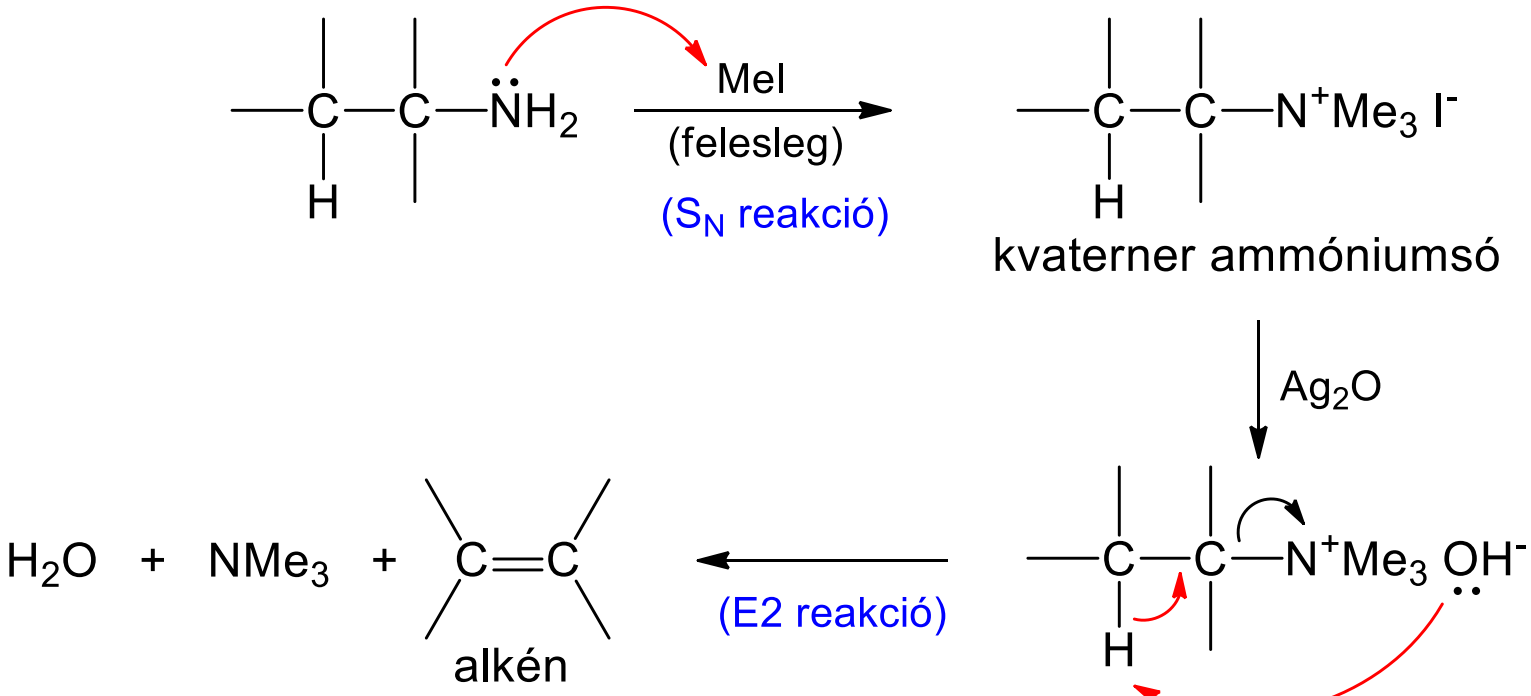
IR-spektrum


Transmittance (%)
100
90
80
70
60
50
40
30
20
10
0
4000
3600
3200
2800
2400
2000
1800
1600
1400
1200
1000
800
650
Wavenumber (cm^{-1})
primary N—H
(asym. and sym. stretch)
aromatic
C—H
(stretch)
aliphatic
C—H
(stretch)
aromatic
combination
band
NH$_2$
CH$_3$
C=C (ring stretch),
N—H (bend)
C—N
(stretch)
C—H
(out-of-plane
bend)
N—H
(wag)

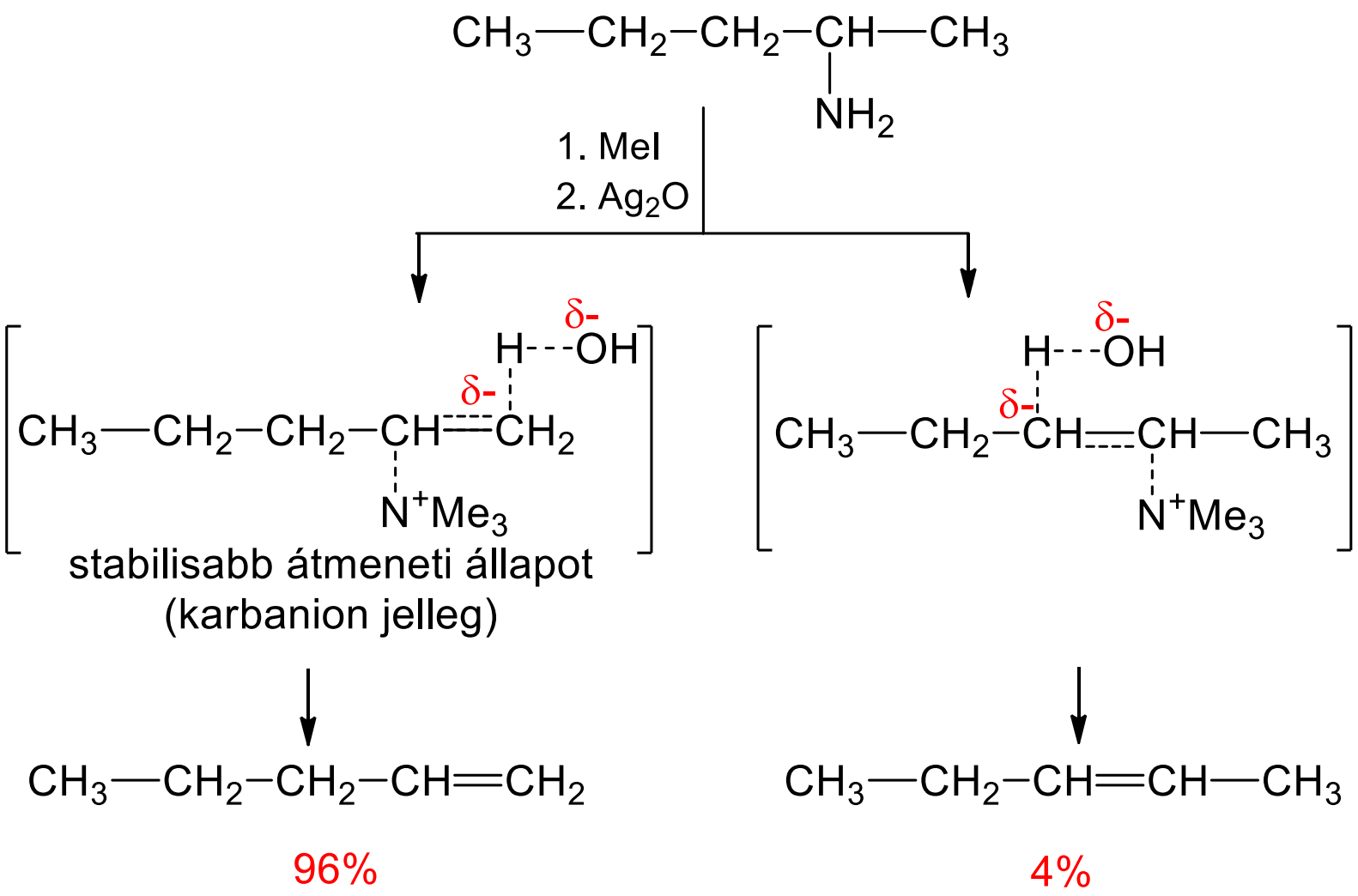
^{1}H NMR spektrum



Hofmann-elimináció (aminból alkén)



Szelektivitás a Hofmann-eliminációban (Hofmann szabály)



Hofmann-szabály (a Zajcev-szabállyal ellentétes termék)

Nitrogéntartalmú szénvegyületek

Vegyülettípus	Funkciós csoport	Példa
Amin	R–NH_2	CH_3NH_2
Ammóniumion	R_4N^+ (R = H vagy alkil)	$(CH_3)_4N^+$ Br^-
Imin	RR'C=NH	CH_3–CH=NH
Schiff-bázis	RR'C=NR''	CH_3–CH=NCH_3
Oxim	RR'C=N–OH	CH_3CH=NOH
Hidrazon	RR'C=N–NH_2	$(CH_3)_2$C=NNH_2
Azovegyület	R–N=N–R'	C_6H_5N=N–C_6H_5
Nitril	R–C≡N	CH_3CN
Diazóniumion	R–N^+≡N	$C_6H_5N_2^+$
Diazovegyület	RR'C^-–N^+≡N	CH_2N_2
Azid	R–N=N^+=N^-	CH_3N_3
Nitrovegyület	R–NO_2	CH_3NO_2
Savamid	R–CO–NH_2	CH_3CONH_2
Savhidrazid	R–CO–$NHNH_2$	$CH_3CONHNH_2$
Savazid	R–CO–N=N^+=N^-	CH_3CON_3