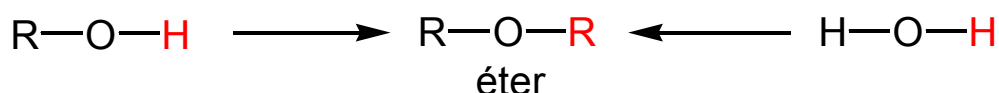
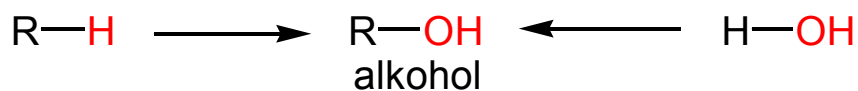


# ALKOHOLOK ÉS SZÁRMAZÉKAIK

## Levezetés



## Elnevezés

### Nyíltláncú, telített alkoholok

általános név: alkanol  
alkil-alkohol

$\text{CH}_3\text{OH}$   
metanol  
metil-alkohol

$\text{CH}_3\text{CH}_2\text{OH}$   
etanol  
etil-alkohol

$\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$   
propán-1-ol  
propil-alkohol

$\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$   
propán-2-ol  
izopropil-alkohol

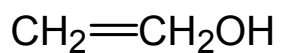
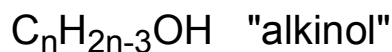
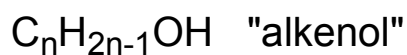
$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$   
bután-1-ol  
butil-alkohol

$\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_3$   
bután-2-ol  
szek-butil-alkohol

$\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_2\text{OH}$   
izobutil-alkohol

$\text{CH}_3\text{C}(\text{CH}_3)_2\text{OH}$   
terc-butil-alkohol

## Telítetlen alkoholok



vinil-alkohol  
(nem létképes)

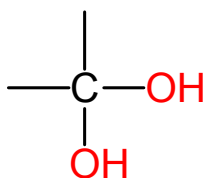


allil-alkohol

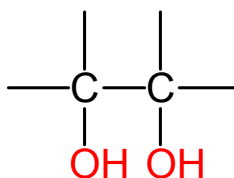


propargil-alkohol

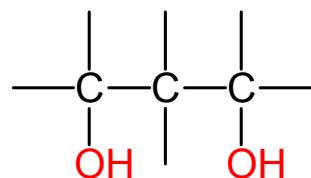
## Többértékű alkoholok



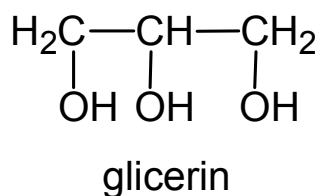
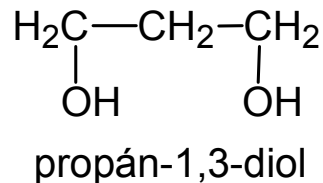
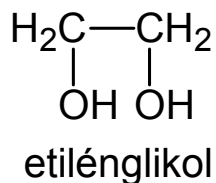
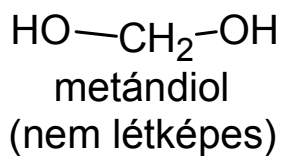
geminális



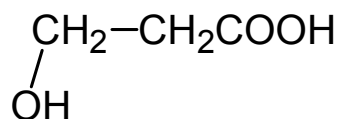
vicinális



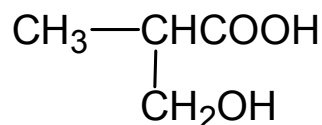
diszjunkt



## Származékok

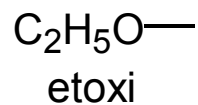
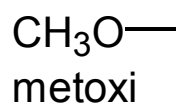
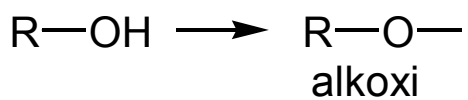


3-hidroxi-propionsav

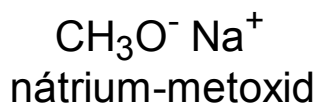
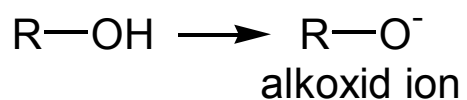


2-metil-3-hidroxi-propionsav

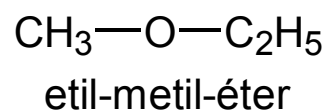
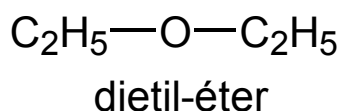
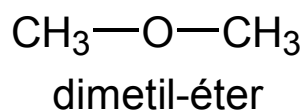
## Csoportnevek



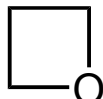
## Sók



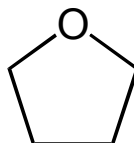
## Éterek



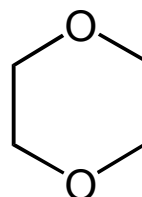
etilén-oxid



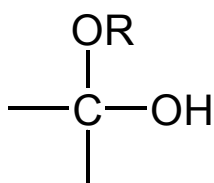
trimetilén-oxid



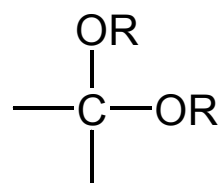
tetrahidrofurán



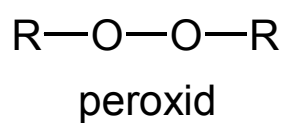
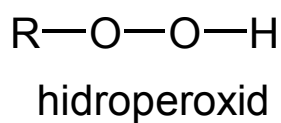
dioxán



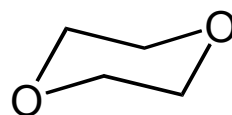
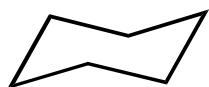
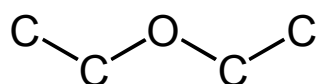
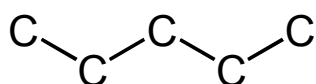
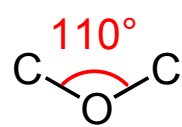
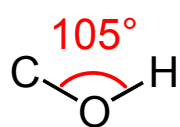
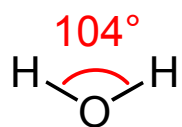
félacetál



acetál



## AZ ALKOHOLOK ÉS ÉTEREK SZERKEZETE

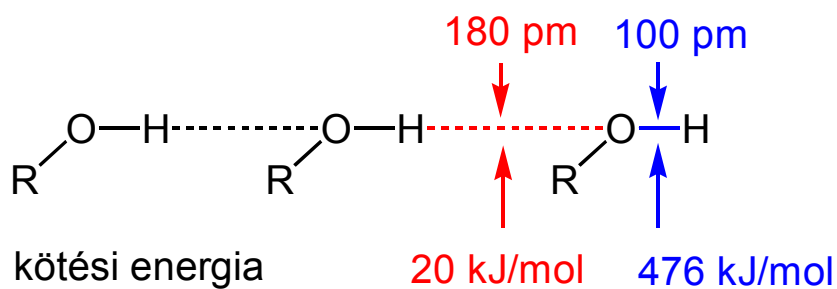


analóg szerkezetek

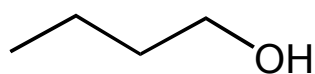
## AZ ALKOHOLOK FIZIKAI TULAJDONSÁGAI

	Molekulatömeg	Forráspont (C°)
CH <sub>3</sub> OH	32	65
CH <sub>3</sub> CH <sub>3</sub>	30	-89
CH <sub>3</sub> CH <sub>2</sub> OH	46	78
CH <sub>3</sub> OCH <sub>3</sub>	46	-24
CH <sub>3</sub> CH <sub>2</sub> CH <sub>3</sub>	44	-42
HOCH <sub>2</sub> -CH <sub>2</sub> OH	62	200
CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>3</sub>	58	-1
HOCH <sub>2</sub> -CHOH-CH <sub>2</sub> OH	92	290
CH <sub>3</sub> (CH <sub>2</sub> ) <sub>4</sub> CH <sub>3</sub>	86	69

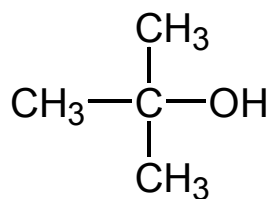
### Hidrogénkötés



### Olvadáspont



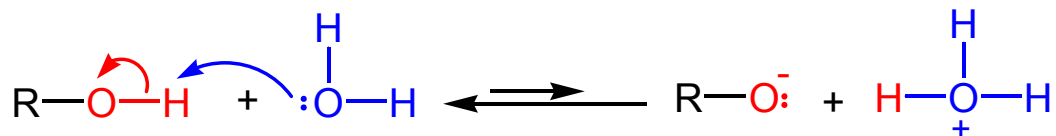
-90 °C



26 °C

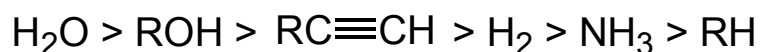
# AZ ALKOHOLOK SAV-BÁZIS TULAJDONSÁGAI

## Savi jelleg

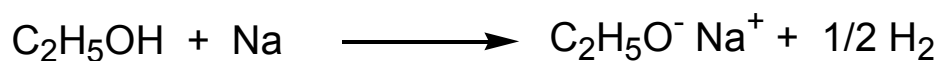
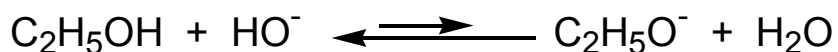


H—A	MeOH	H <sub>2</sub> O	EtOH	Me <sub>3</sub> COH
<b>pK<sub>a</sub></b>	15.5	15.7	15.9	18

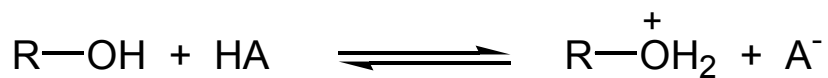
## aciditási sorrend



## bázicitási sorrend

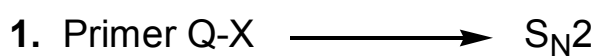
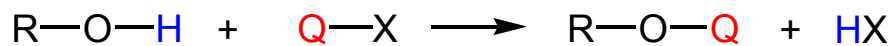


## Bázicitás

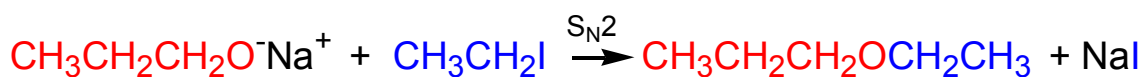
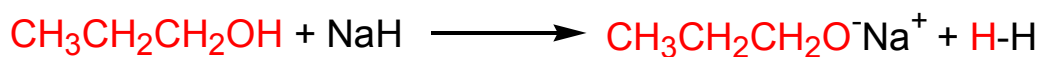


# AZ ALKOHOLOK KÉMIAI TULAJDONSÁGAI

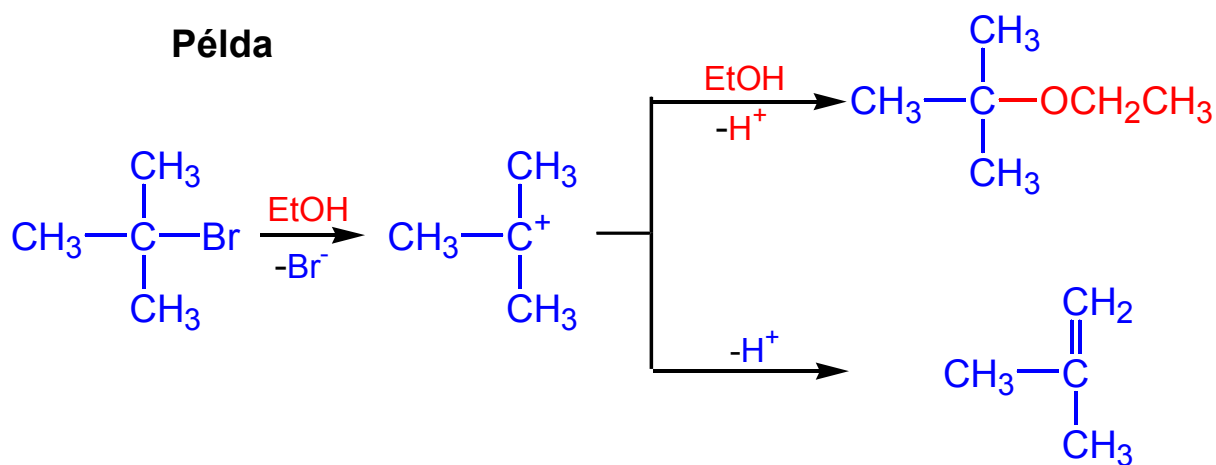
## Az alkoholok alkilezése; Williamson éterszintézis



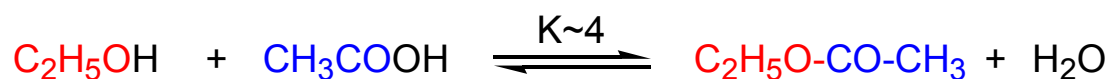
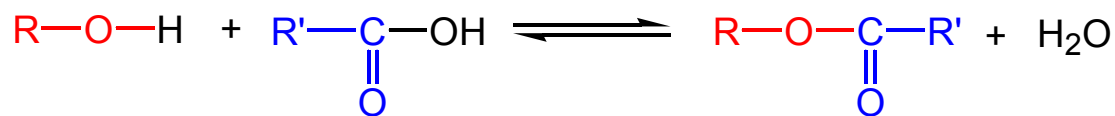
### Példa



### Példa

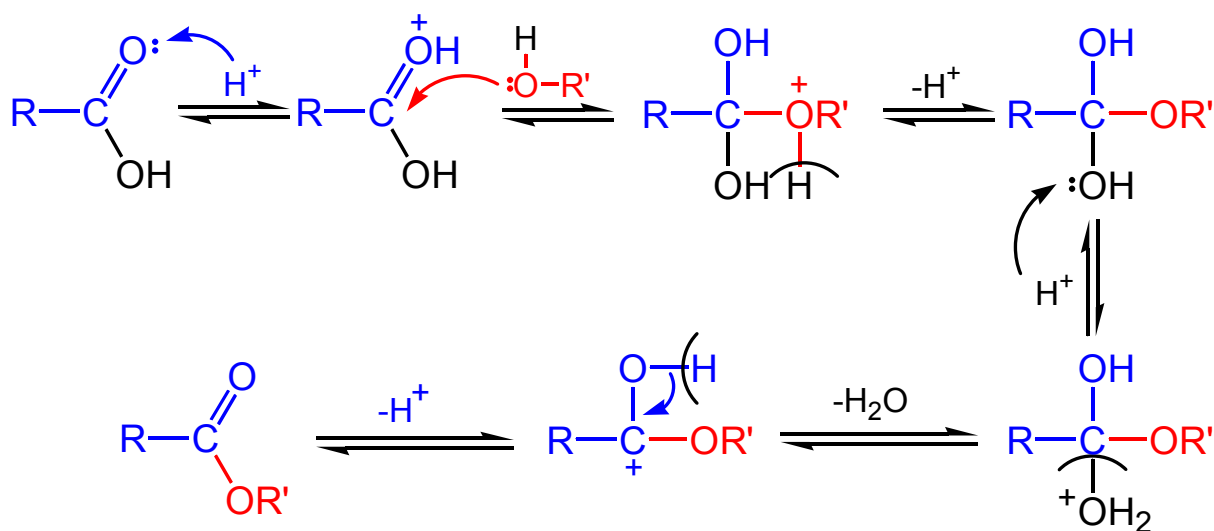


## Az alkoholok acilezése. Közvetlen észterezés.

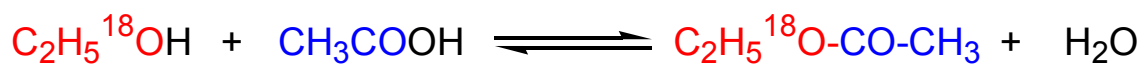


## Savkatalizált észterezés

### a) Primer alkoholok reakciója

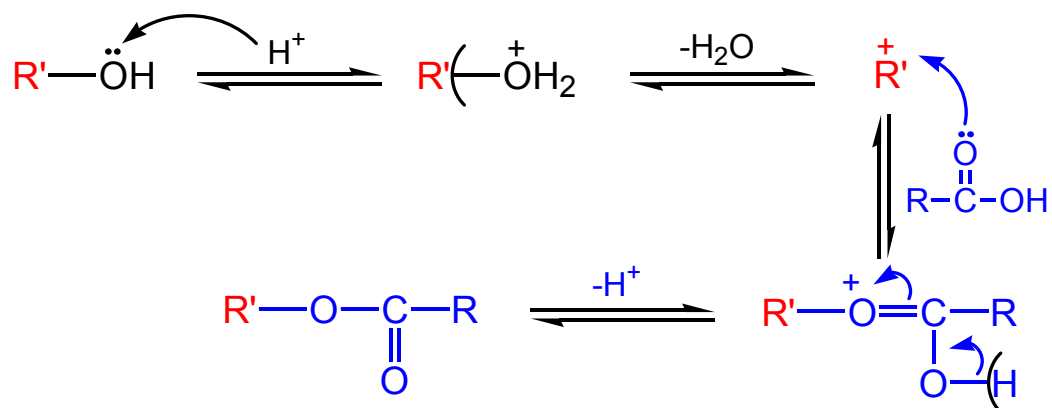


acil-O kapcsolat

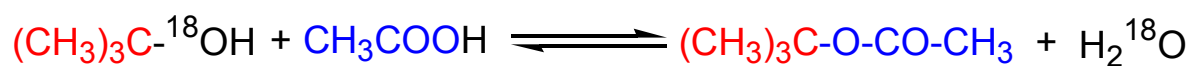




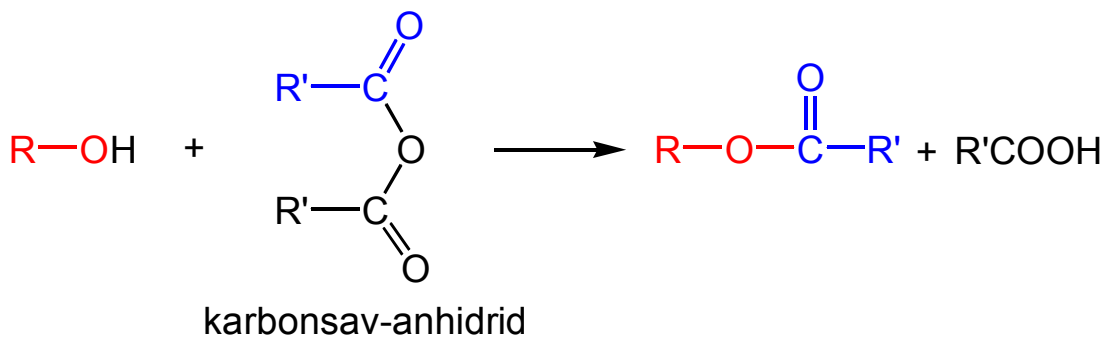
## b) Tercier alkoholok reakciója



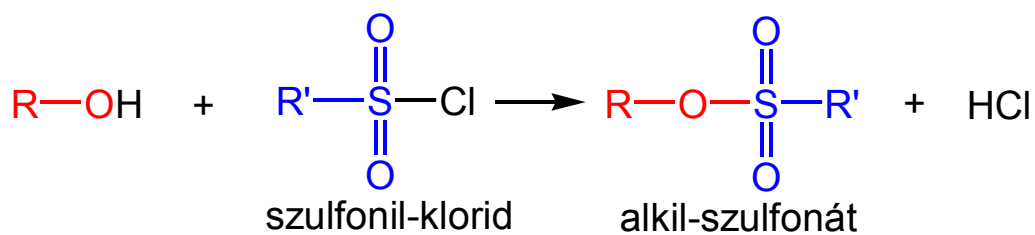
alkil-O kapcsolat



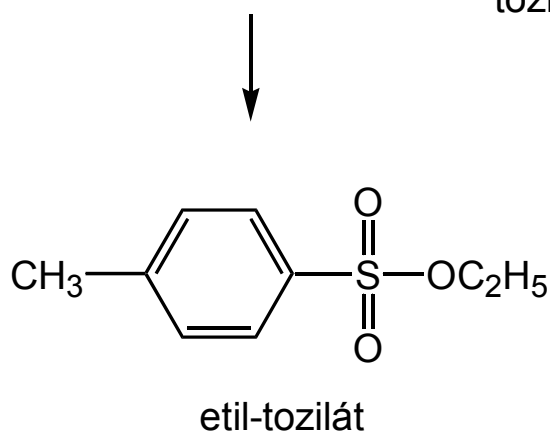
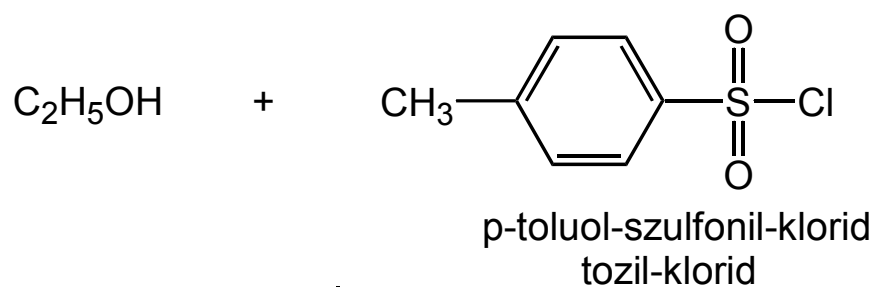
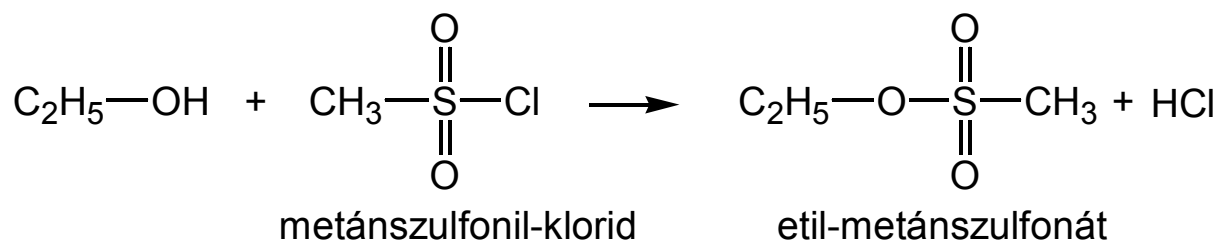
## Egyéb acilező reagensek



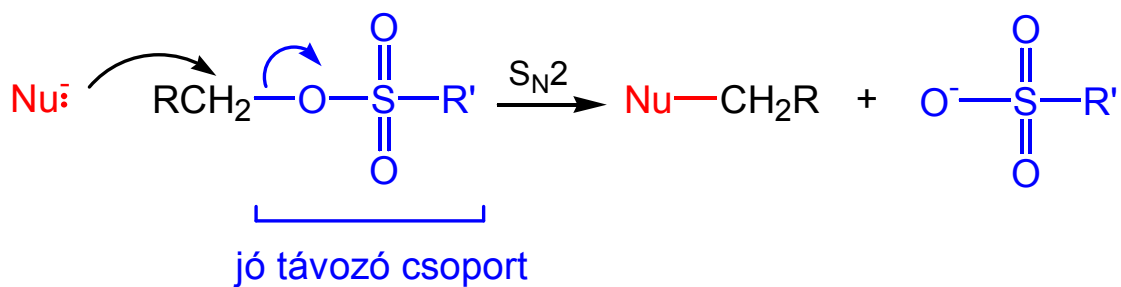
## Szulfonsavak észterei



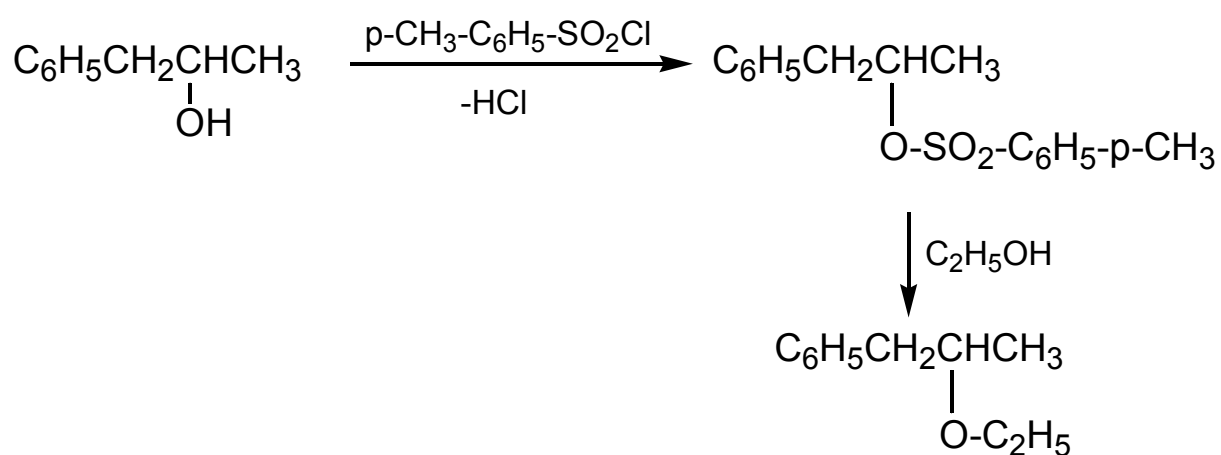
### Példák



## Szulfonátok felhasználása S<sub>N</sub>2 reakciókban

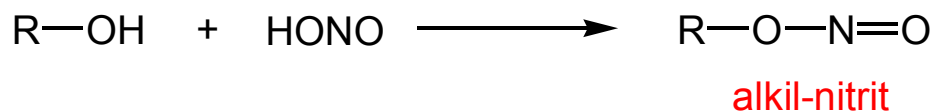


### Példa

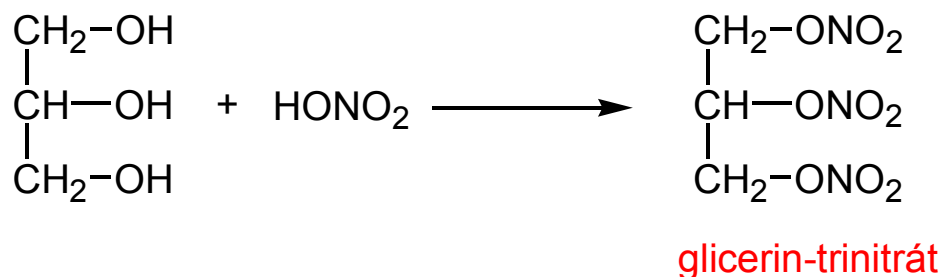
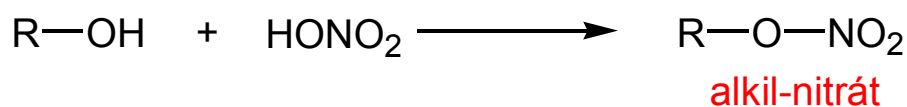


## Alkoholok szervesetlen savakkal képzett észterei

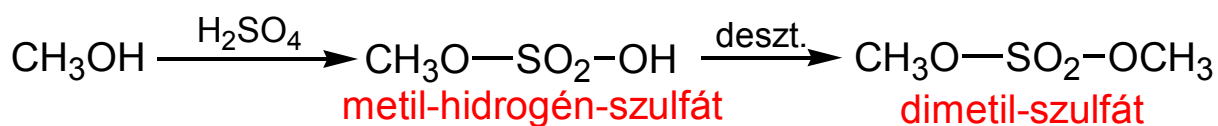
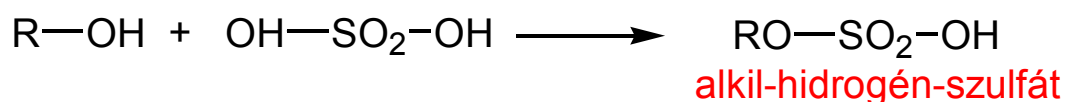
### Salétromossav észterek



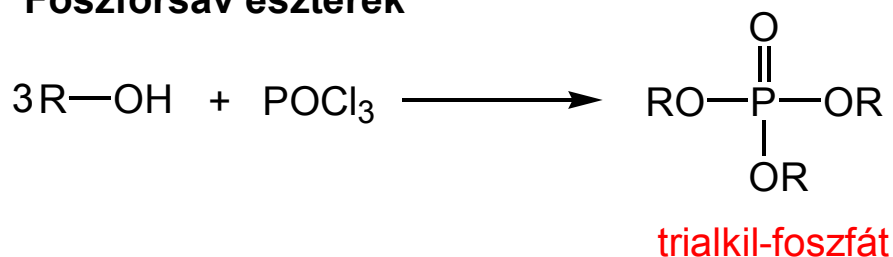
### Salétromsav észterek



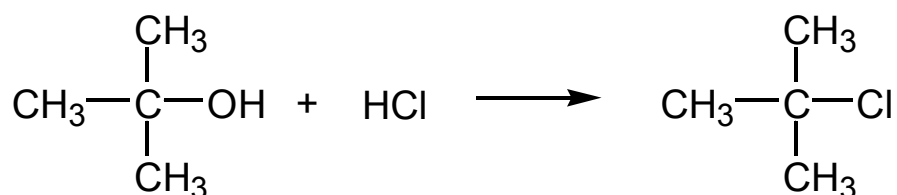
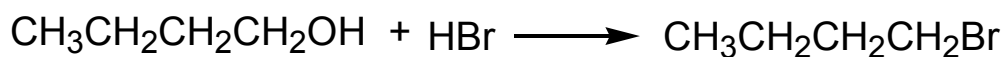
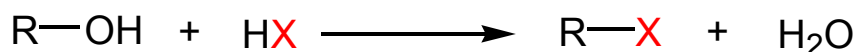
### Kénsav észterek



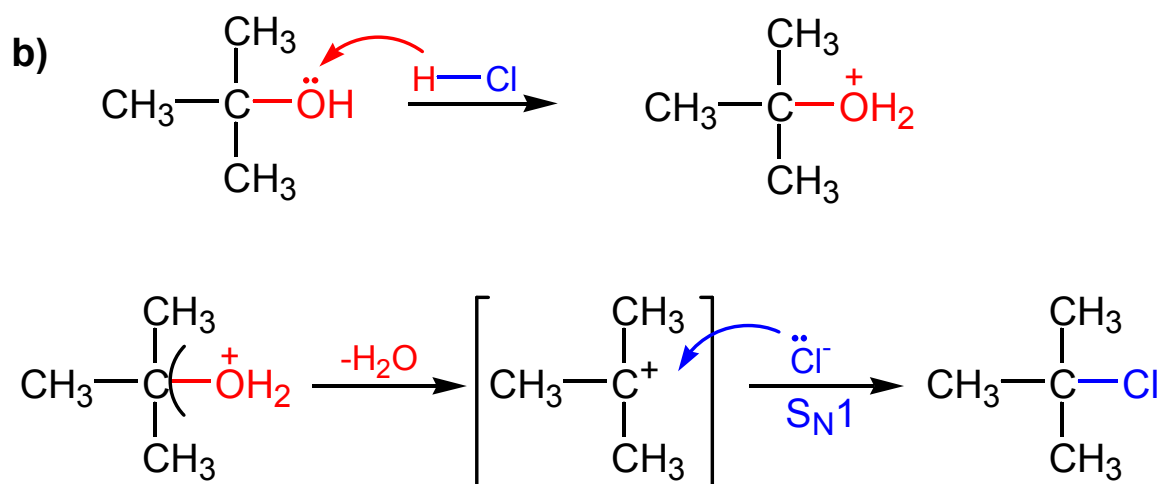
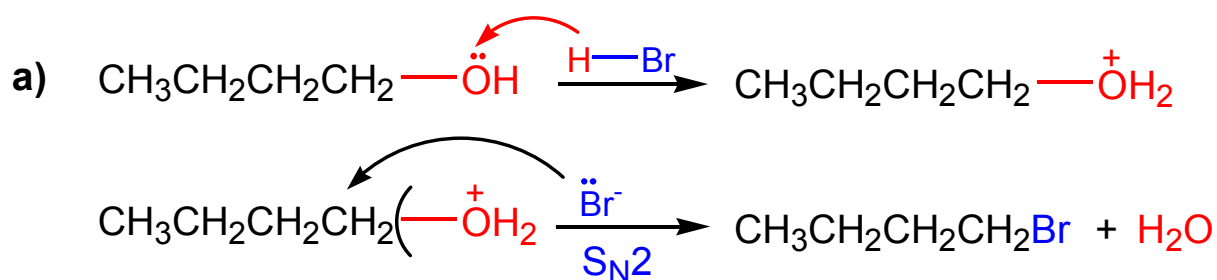
### Foszforsav észterek



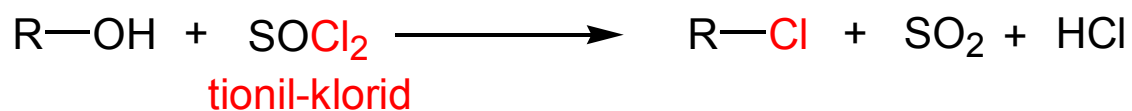
## Alkil-halogenidek előállítása alkoholokból



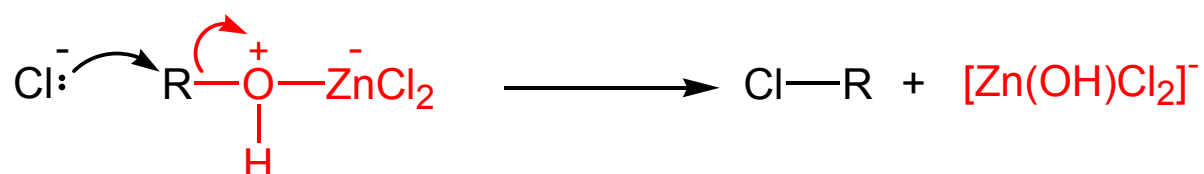
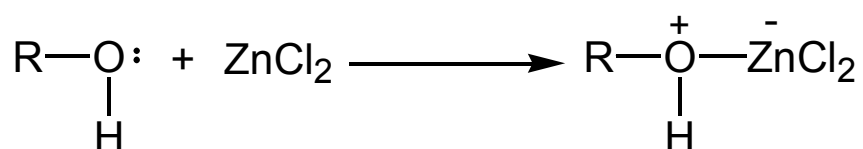
### Mechanizmus



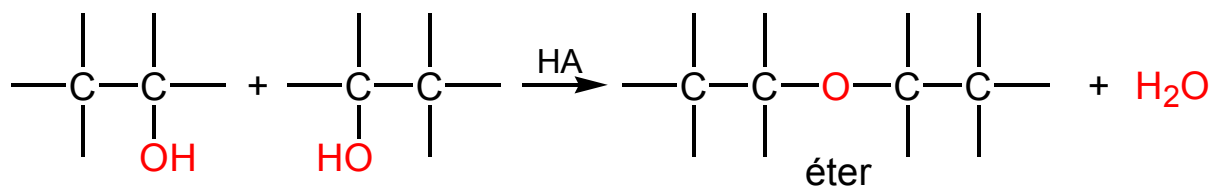
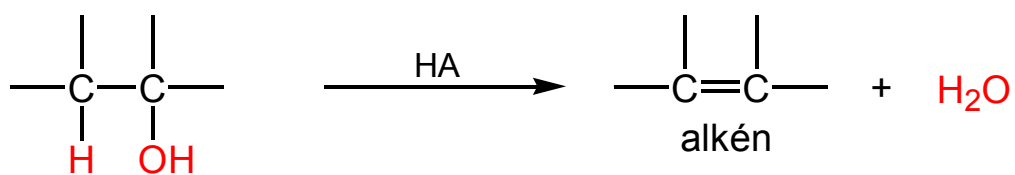
## Egyéb halogénező reagensek



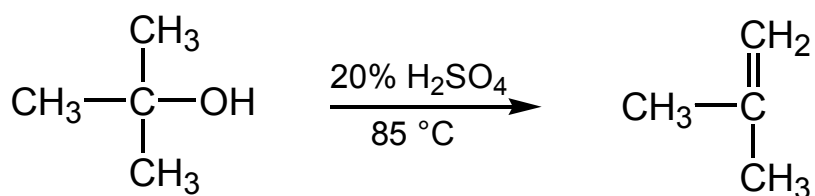
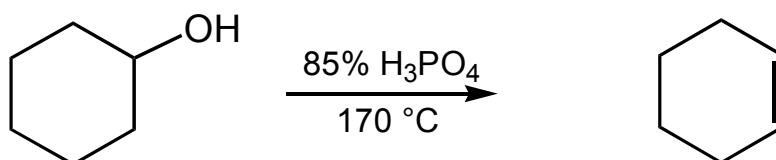
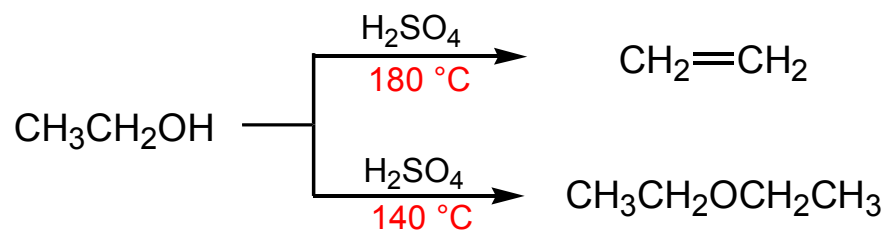
## Lucas reagens; cc. HCl + ZnCl<sub>2</sub>



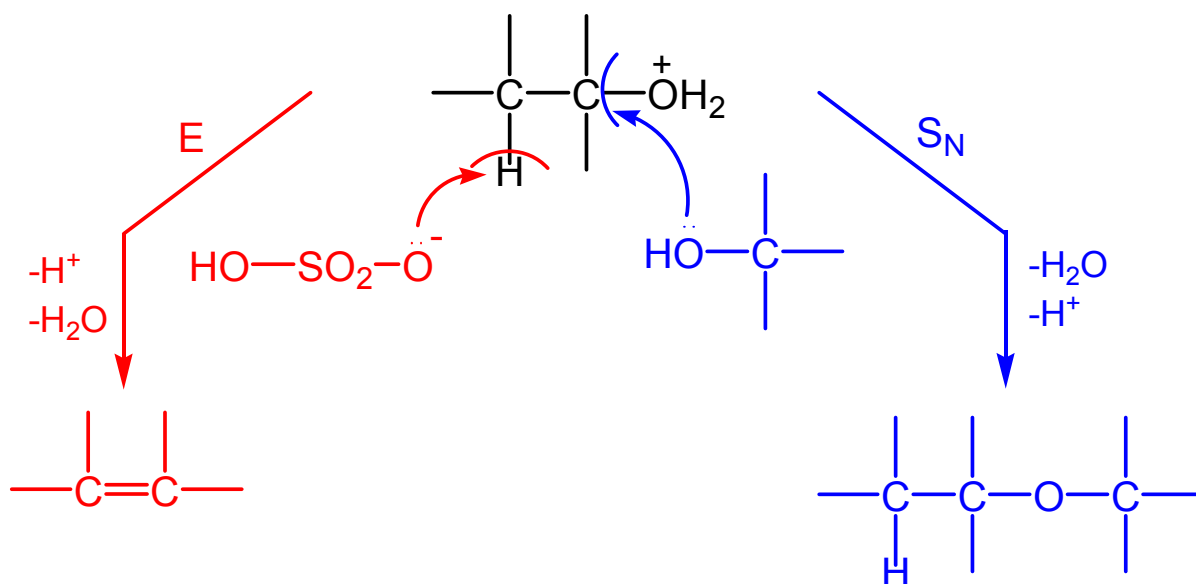
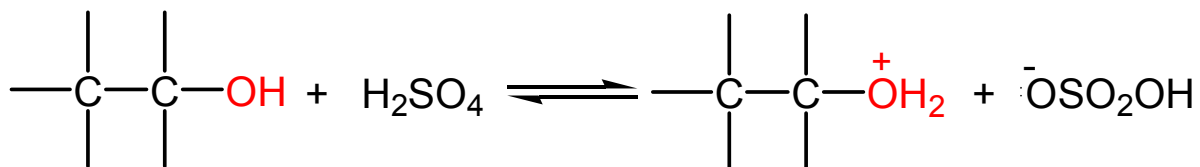
## Az alkoholok dehidratálása



### Példák



## Mechanizmus



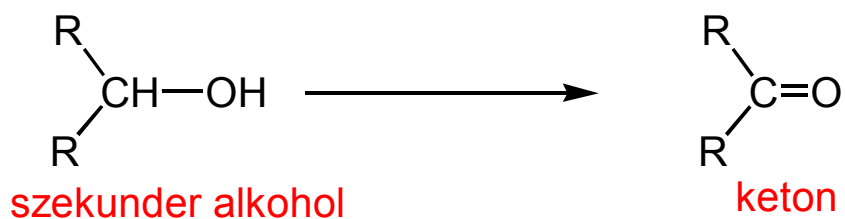
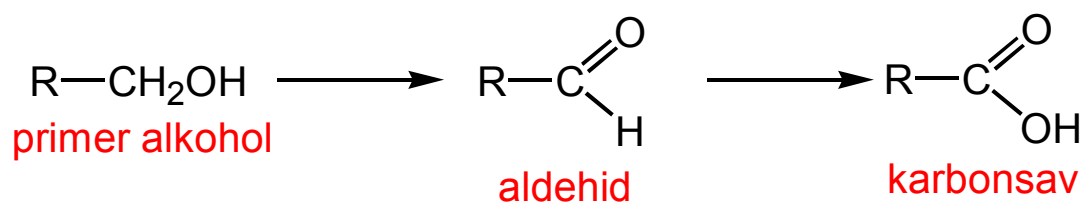
1. Primer alkohol  $\longrightarrow$  éter ( $\text{S}_{\text{N}}2$ ), alkén ( $\text{E}_2$ )  
(hőmérsékletfüggés)

2. Szekunder alkohol  $\longrightarrow$  **alkén**, éter

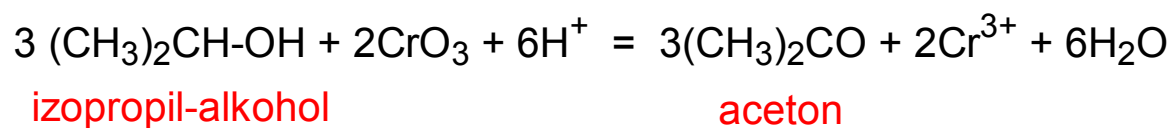
3. Tercier alkohol  $\longrightarrow$  alkén ( $\text{E}_1$ )



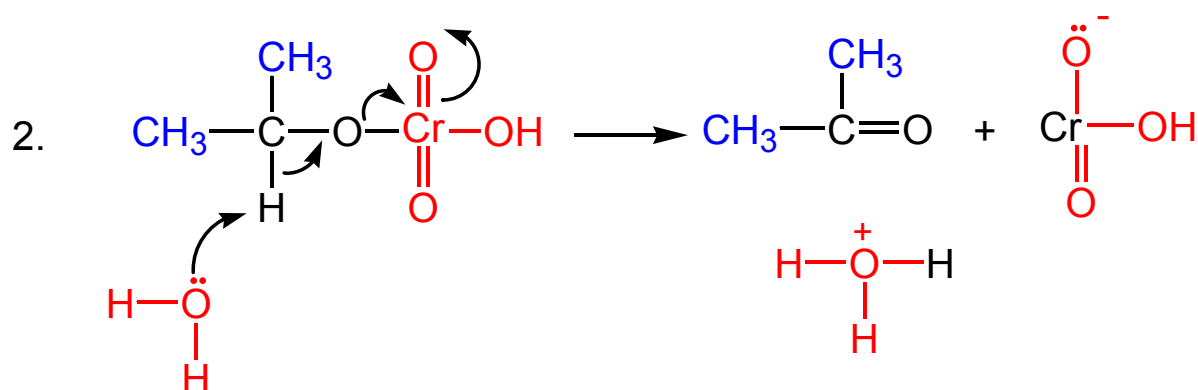
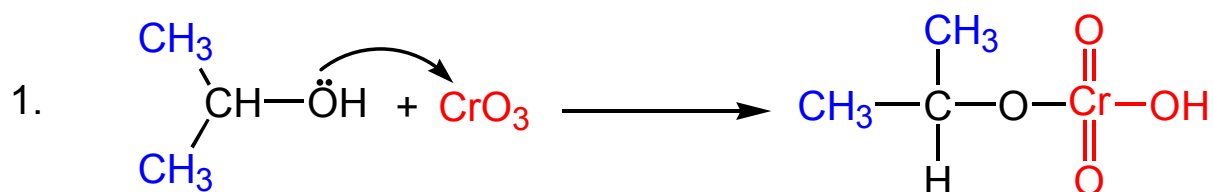
## Az alkoholok oxidációja



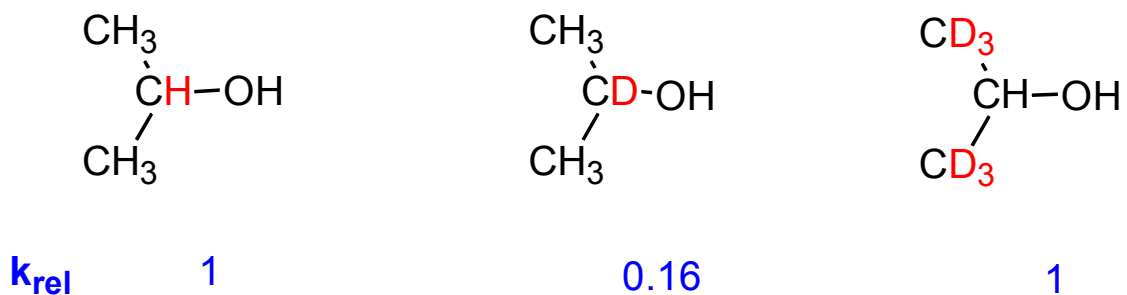
oxidálószer:  $\text{CrO}_3$ ,  $\text{Na}_2\text{Cr}_2\text{O}_7$ ,  $\text{KMnO}_4$



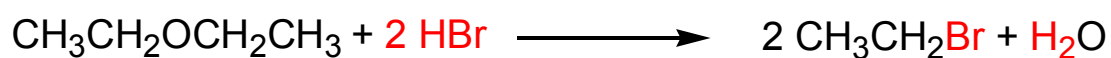
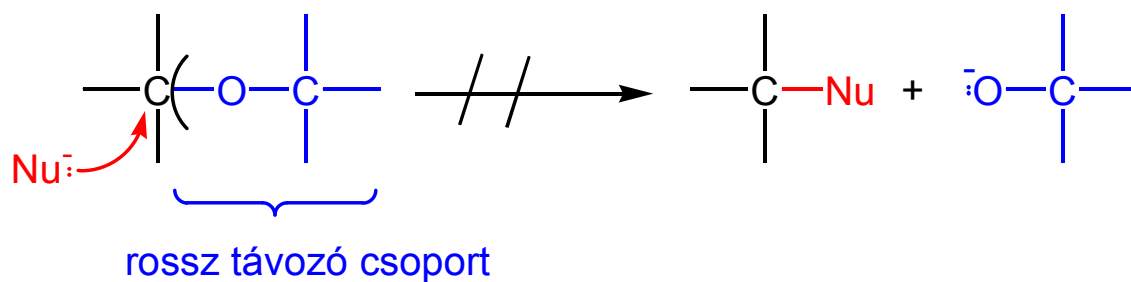
## A króm-trioxidos oxidáció mechanizmusa



kinetikai izotópeffektus



## Az éterkötés hasítása

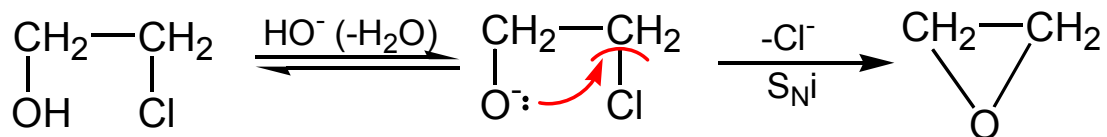


## Mechanizmus

- $$\text{CH}_3\text{CH}_2\ddot{\text{O}}\text{CH}_2\text{CH}_3 + \text{HBr} \longrightarrow \text{CH}_3\text{CH}_2\overset{+}{\underset{\text{H}}{\text{O}}}\text{CH}_2\text{CH}_3 + \ddot{\text{Br}}^-$$
- $$\text{CH}_3\text{CH}_2\overset{+}{\underset{\text{H}}{\text{O}}}\text{CH}_2\text{CH}_3 + \ddot{\text{Br}}^- \longrightarrow \text{CH}_3\text{CH}_2\text{OH} + \text{CH}_3\text{CH}_2\text{Br}$$
- $$\text{CH}_3\text{CH}_2\text{OH} + \text{HBr} \longrightarrow \text{CH}_3\text{CH}_2\text{Br} + \text{H}_2\text{O}$$

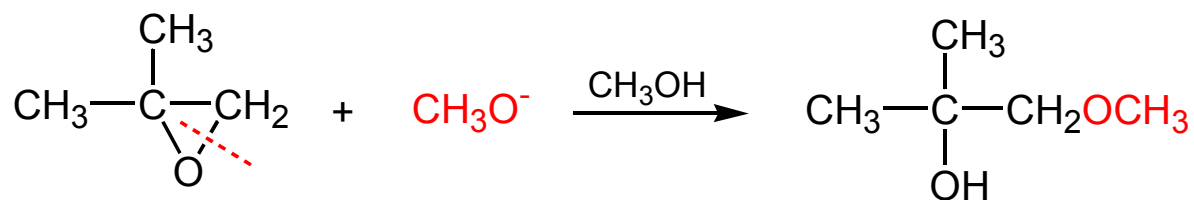
## Epoxidok (oxiránok)

### Előállítás

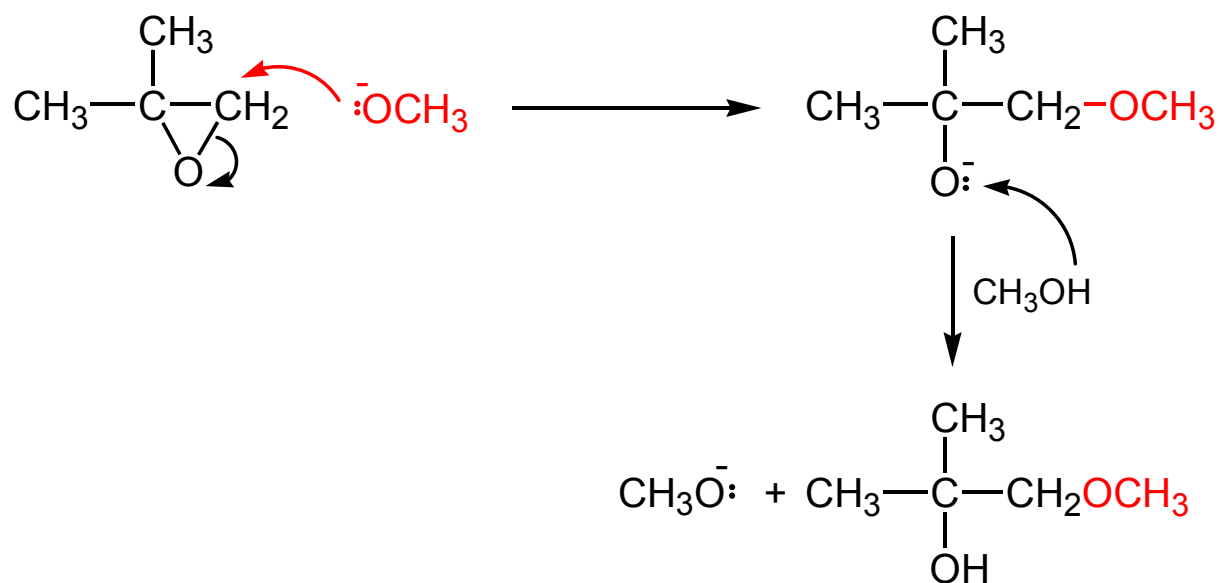


### Az epoxidok hasítása

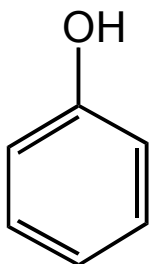
#### A) Bázikus közeg



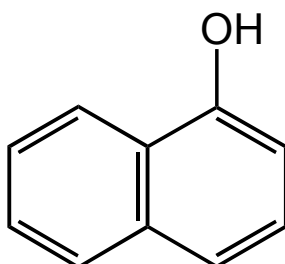
#### Mechanizmus (S<sub>N</sub>2)



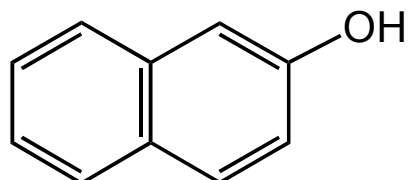
# FENOLOK



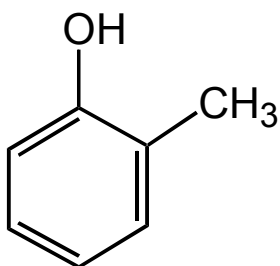
fenol



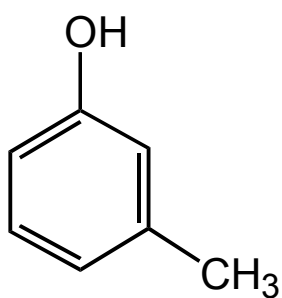
1-naftol



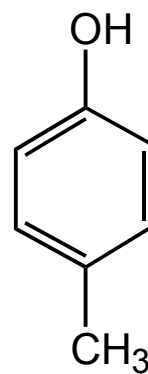
2-naftol



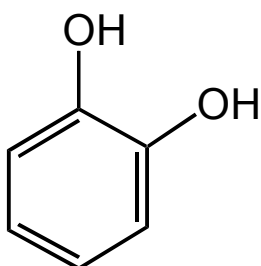
o-krezol



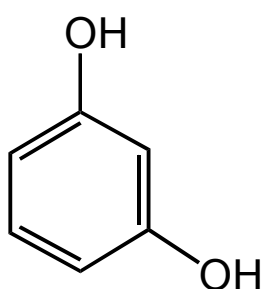
m-krezol



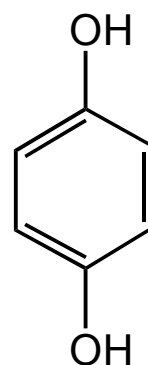
p-krezol



pirokatechin

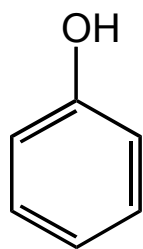


rezorcin

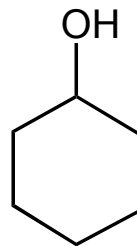


hidrokinon

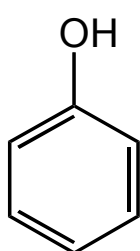
## A fenolok savi jellege



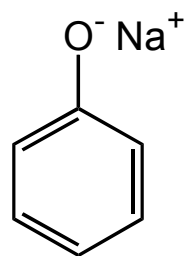
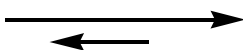
pK=9.9



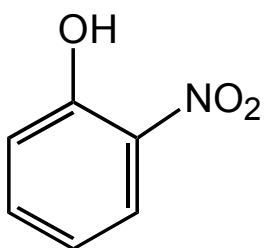
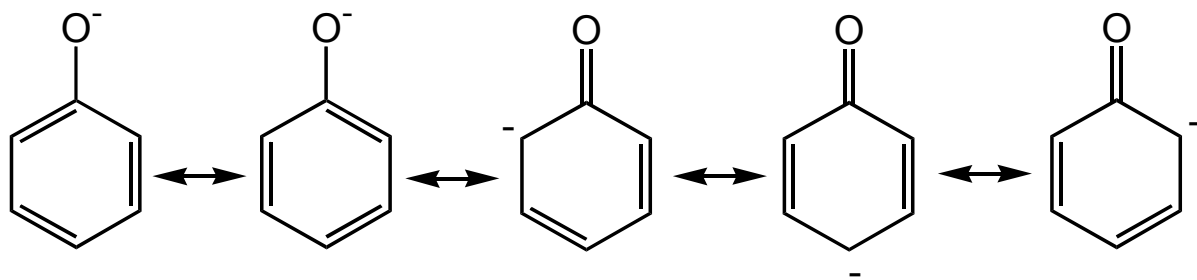
pK=18



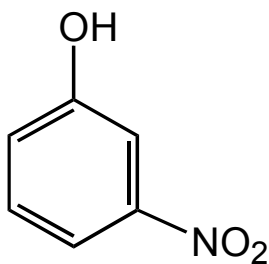
+ NaOH



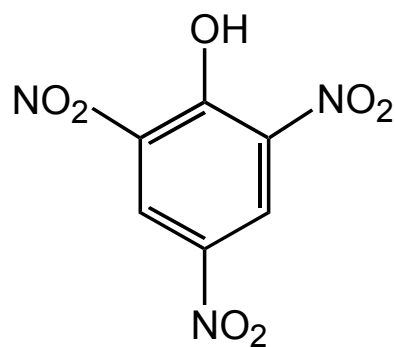
+ H<sub>2</sub>O



pK 7.2

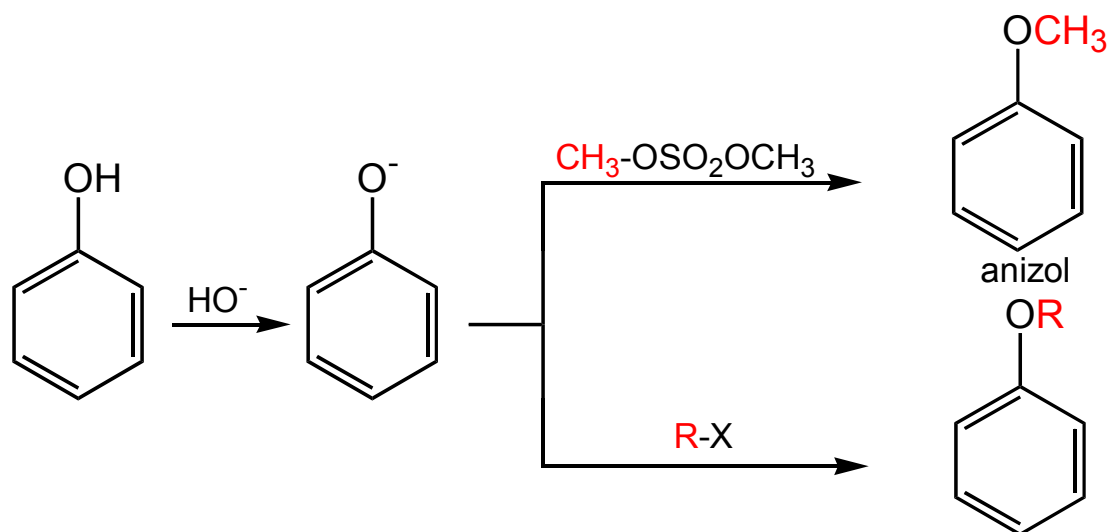


8.3

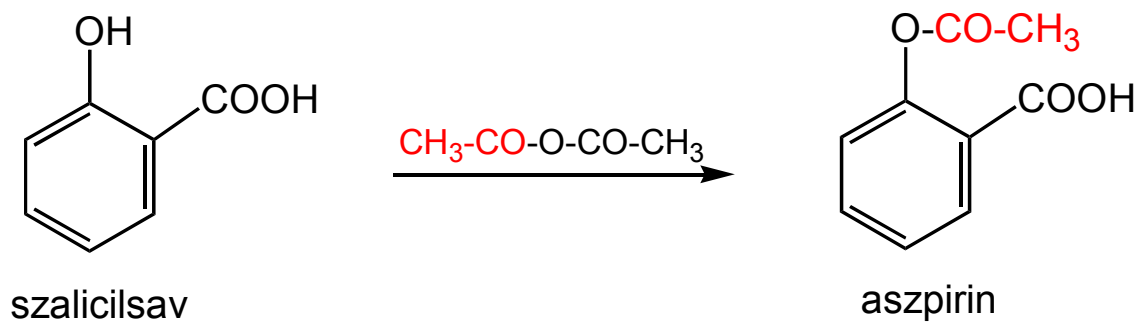
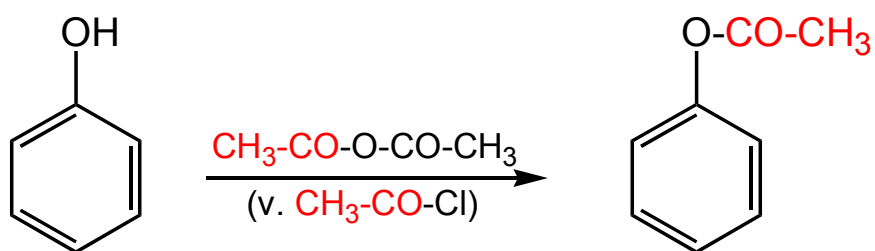


0.4

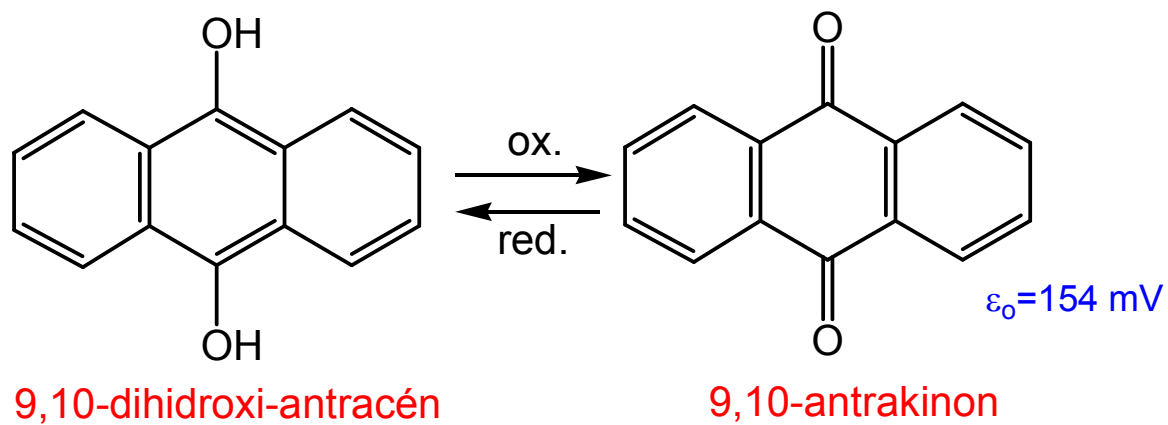
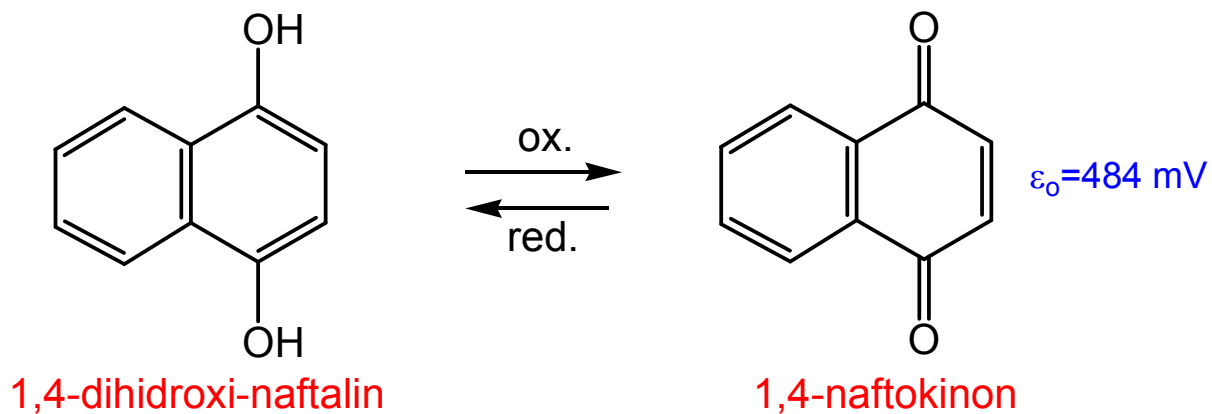
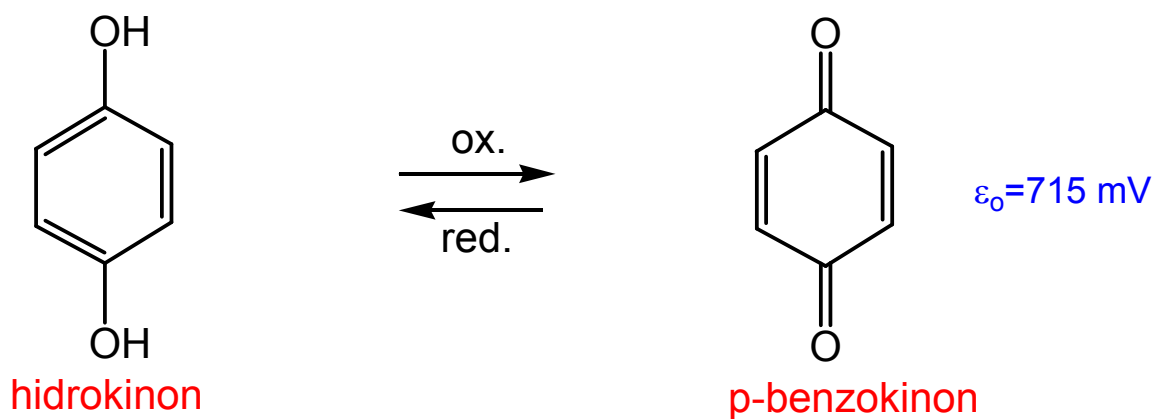
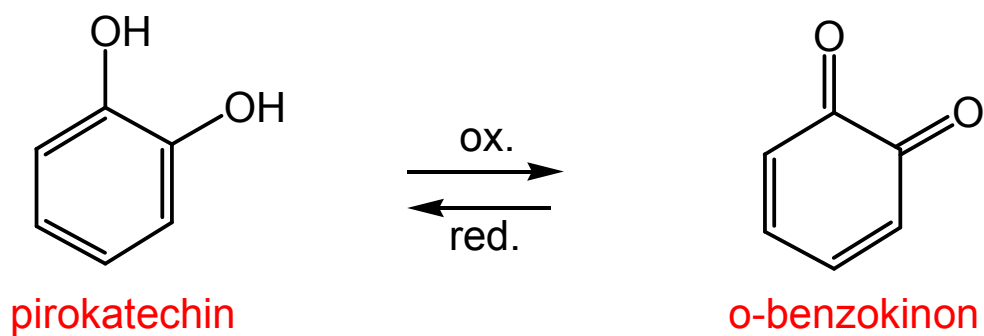
## Alkilezés



## Acilezés

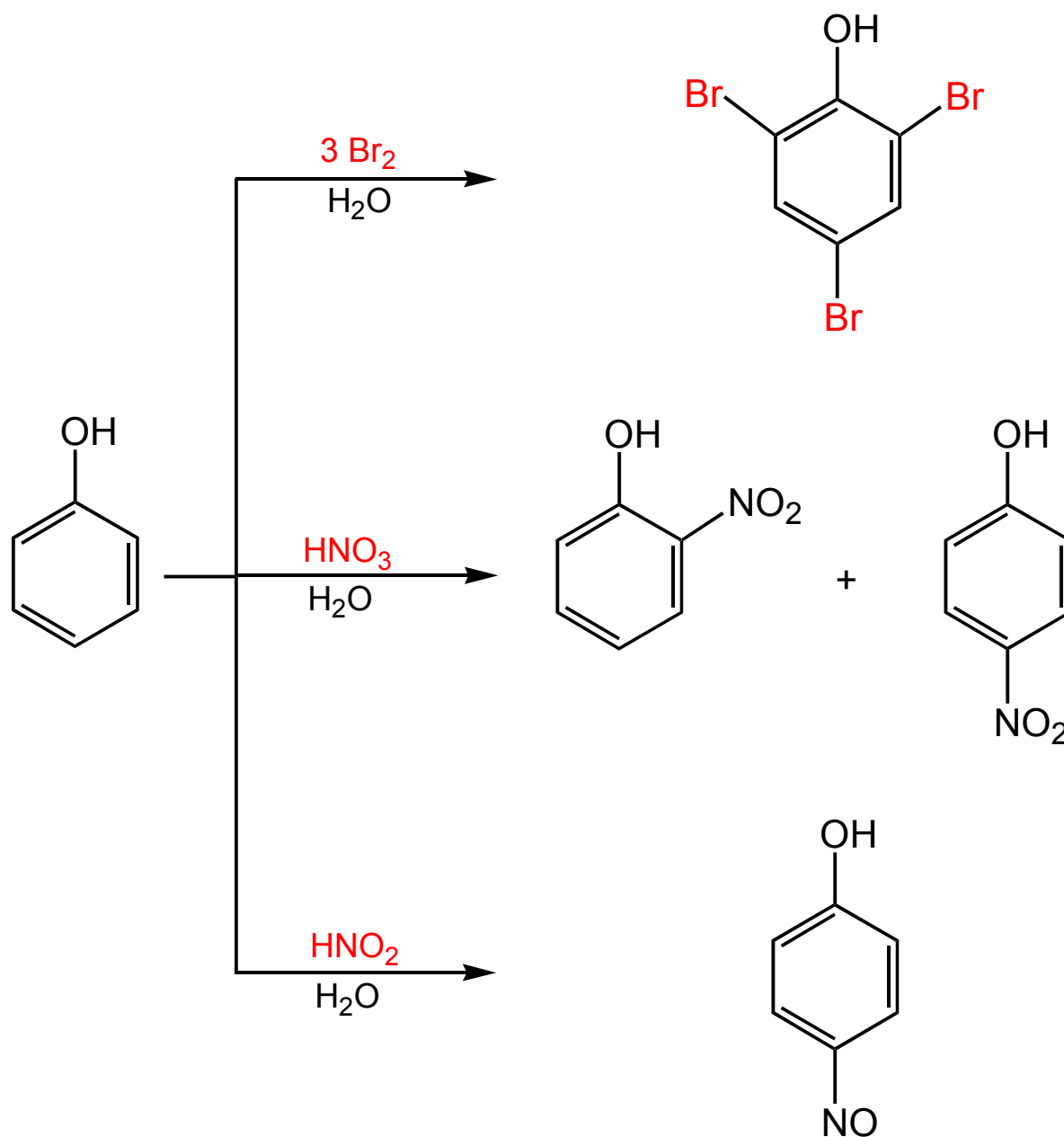


## A fenolok oxidációja (kinonok)

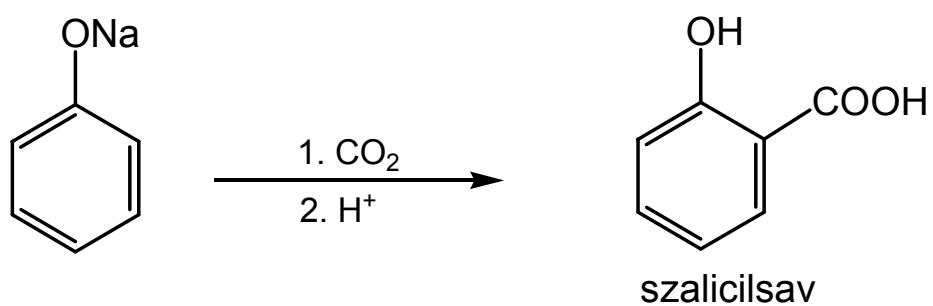
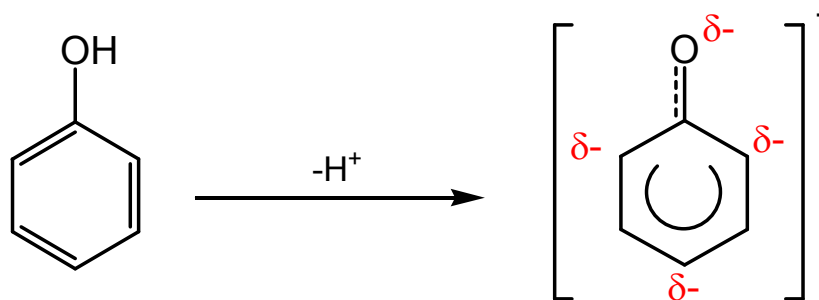




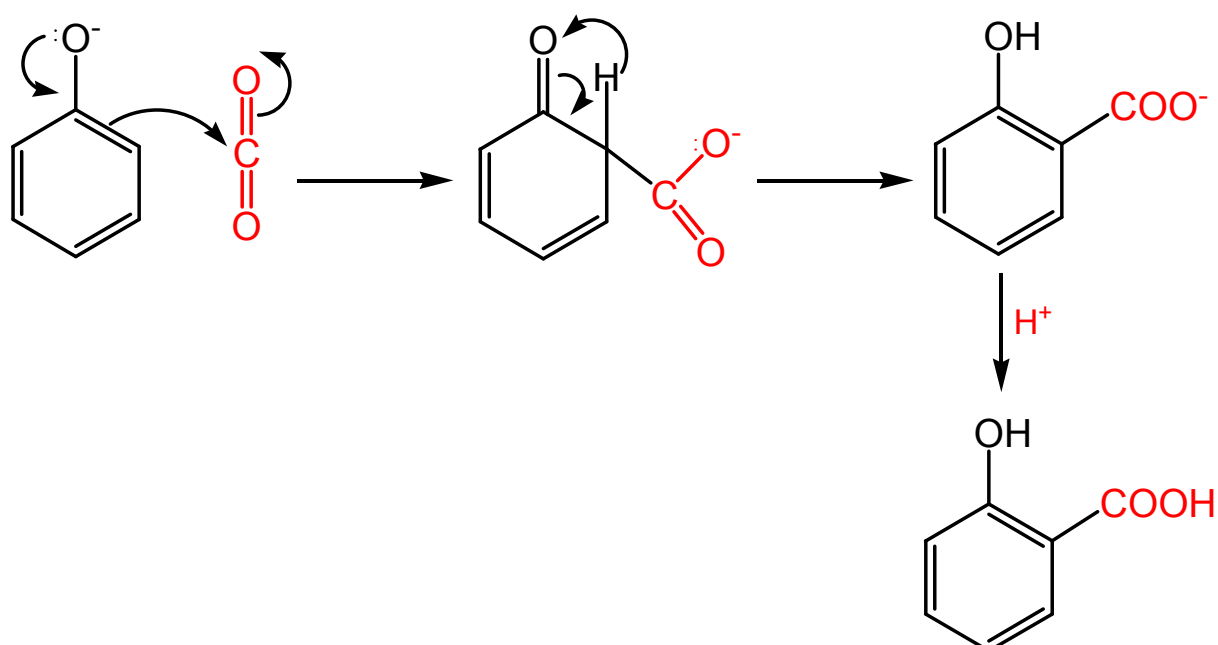
## A fenolok elektrofil szubsztitúciós reakciói



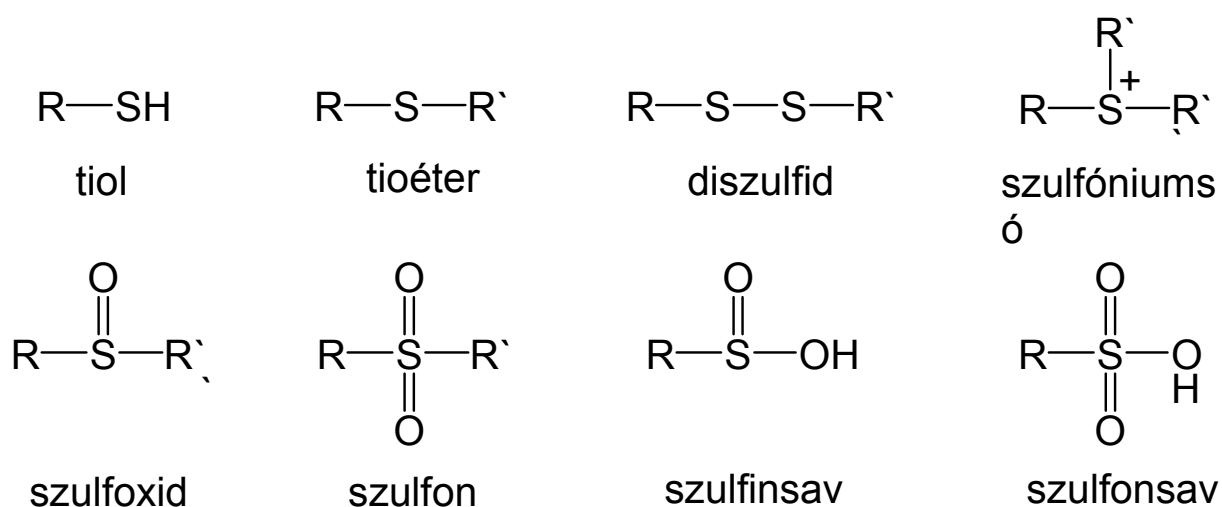
## A fenolátion reaktivitása



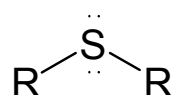
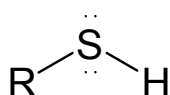
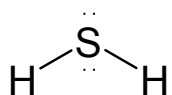
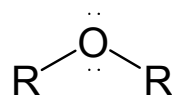
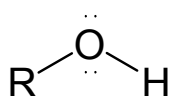
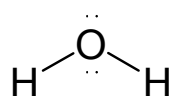
## Mechanizmus



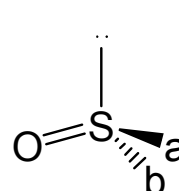
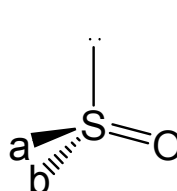
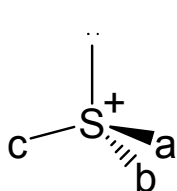
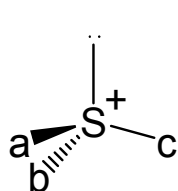
# KÉNORGANIKUS VEGYÜLETEK



## Elektron- és térszerkezet



## Optikai izoméria

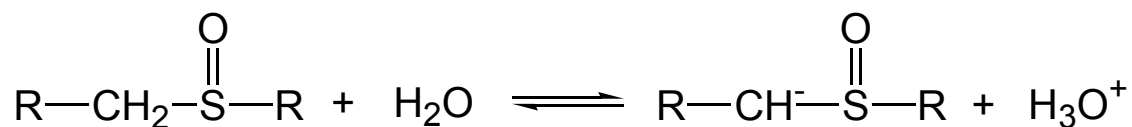
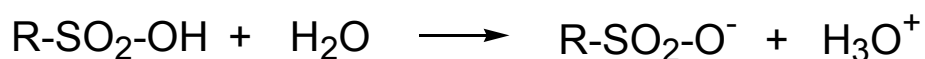
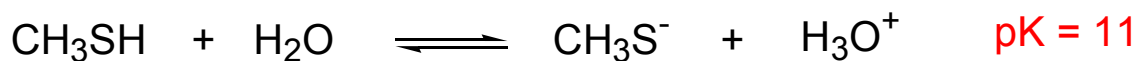
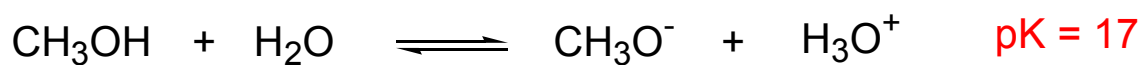


## Fizikai tulajdonságok

Forráspont (°C)

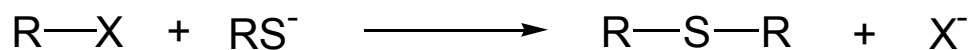
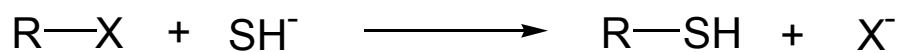
H <sub>2</sub> O	H <sub>2</sub> S	Et-OH	Et-SH
100	-62	78	35
Et <sub>2</sub> O	Et <sub>2</sub> S	$\begin{array}{c} \text{O} \\ \parallel \\ \text{Me}-\text{S}-\text{Me} \end{array}$	$\begin{array}{c} \text{O} \\ \parallel \\ \text{Et}-\text{S}-\text{Et} \\ \parallel \\ \text{O} \end{array}$
37	98	op: 18 °C	op: 72 °C

## Savi jelleg

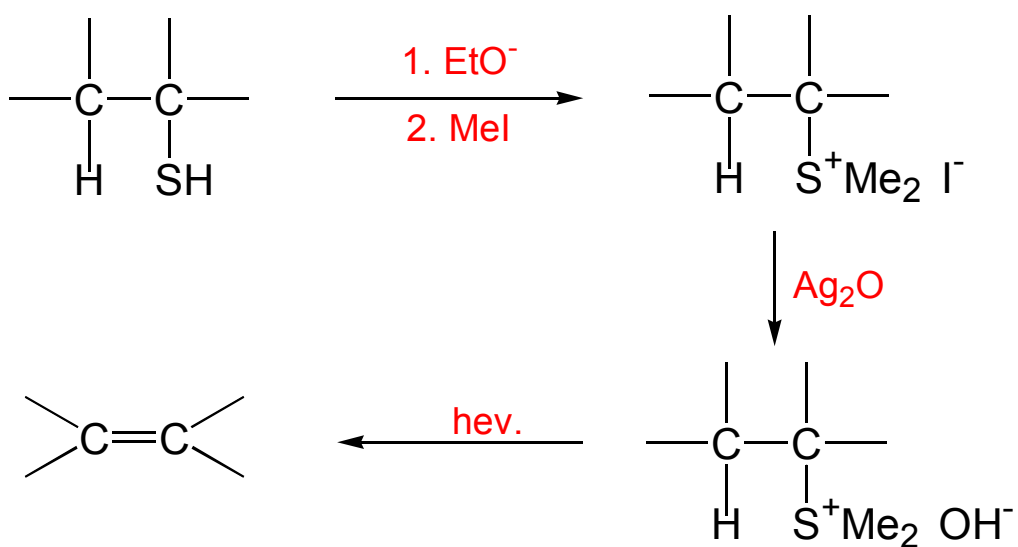


# Kémiai tulajdonságok

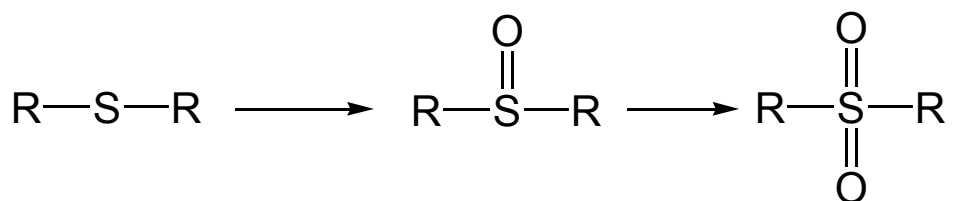
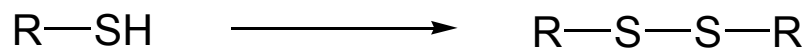
## Szubsztitúciós reakciók



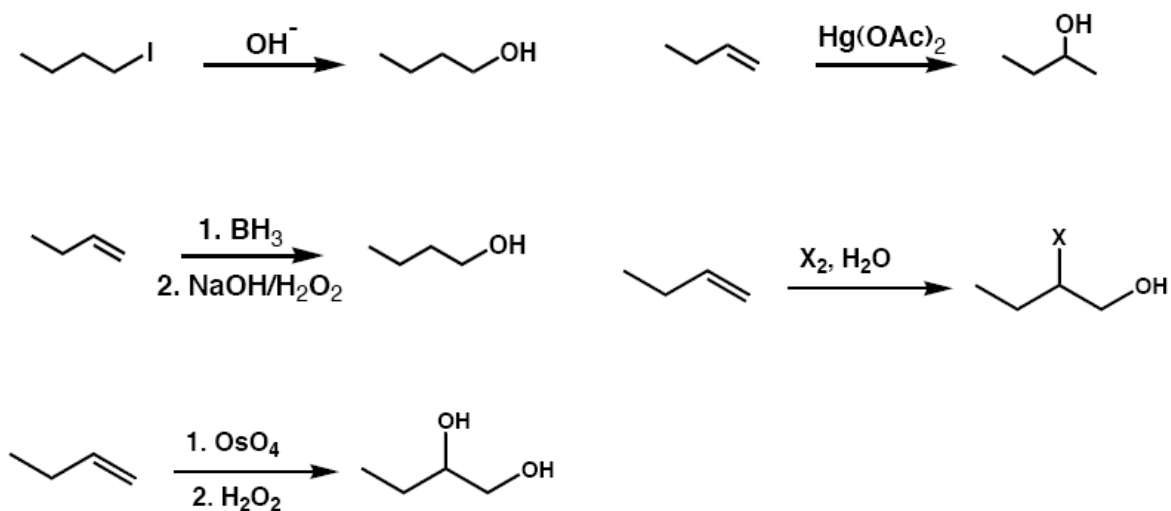
## Eliminációs reakciók



## Oxidációs reakciók

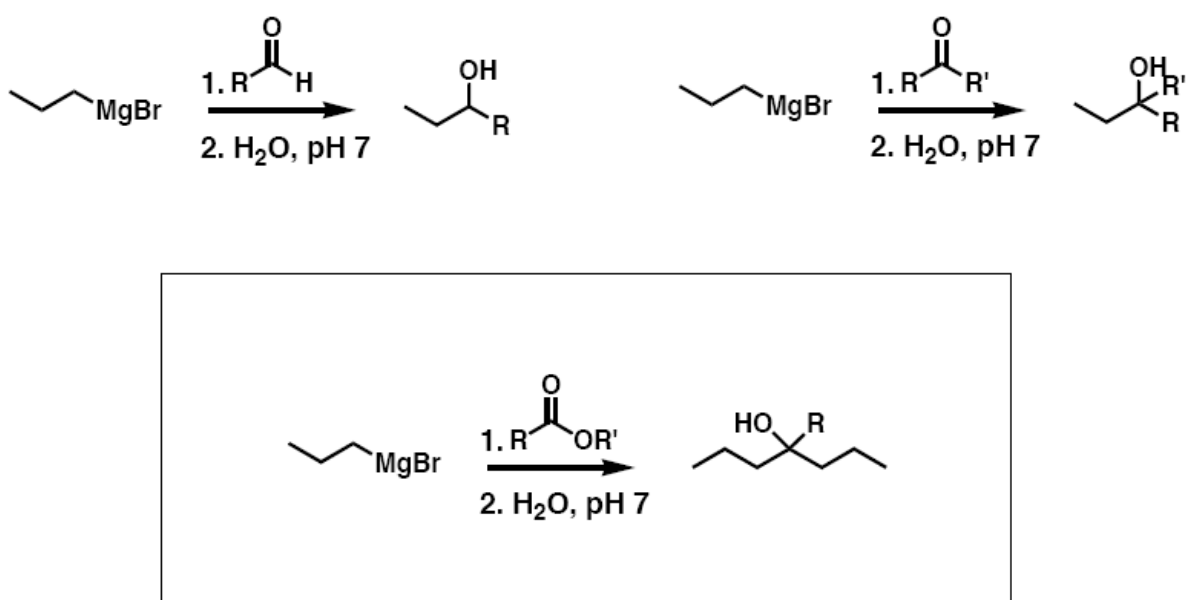


## METHODS FOR THE SYNTHESIS OF ALCOHOLS (to date)



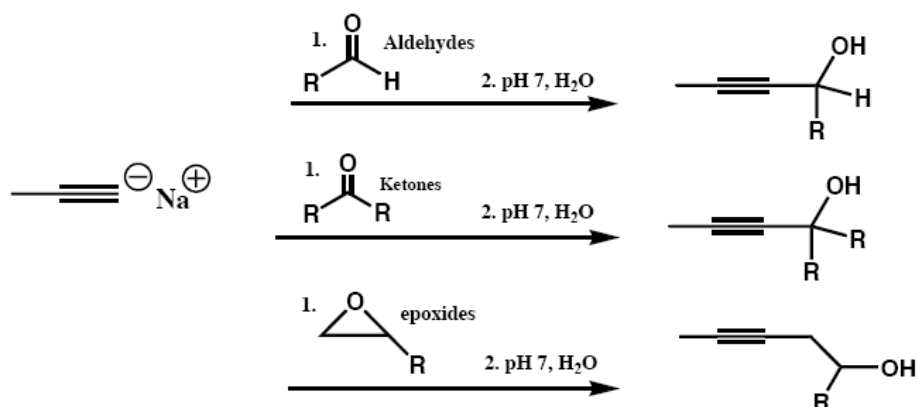
1. **ábra.** Alkoholok előállítására alkalmas módszerek.

## METHODS FOR THE SYNTHESIS OF ALCOHOLS (to date)



2. **ábra.** Alkoholok előállítására alkalmas módszerek (folytatás).

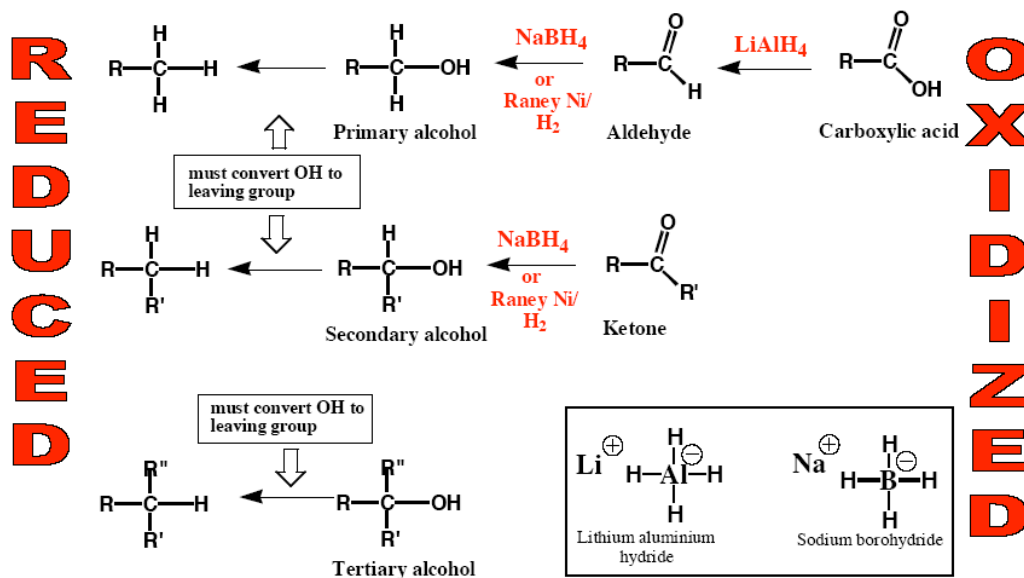
## METHODS FOR THE SYNTHESIS OF ALCOHOLS (to date)



3. **ábra.** Alkohokok előállítására alkalmas módszerek (folytatás).

### Alcohols, carbonyl compounds and carboxylic acids: REDUCTION

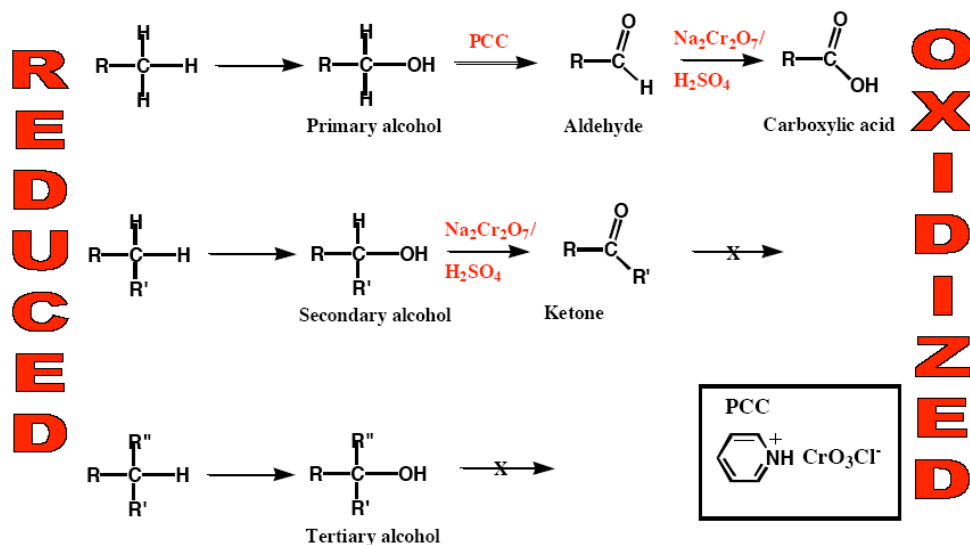
Reduction: Addition of  $\text{H}_2$  (or  $\text{H}^-$ ), loss of  $\text{O}$  or  $\text{O}_2$ ; loss of  $\text{X}_2$



4. **ábra.** Alkohokok és karbonil-vegyületek, ill. karbonsavak egymásba alakítása.

## Alcohols, carbonyl compounds and carboxylic acids: OXIDATION

Oxidation: loss of H<sub>2</sub>, addition of O or O<sub>2</sub>, addition of X<sub>2</sub> (halogens)



5. **ábra.** Alkohokok és karbonil-vegyületek, ill. karbonsavak egymásba alakítása (folytatás).

## Table of K<sub>a</sub> Values Acid-Dissociation Constants of Representative Alcohols

Alcohol	Structure	K <sub>a</sub>	pK <sub>a</sub>
methanol	CH <sub>3</sub> —OH	3.2 x 10 <sup>-16</sup>	15.5
ethanol	CH <sub>3</sub> CH <sub>2</sub> —OH	1.3 x 10 <sup>-16</sup>	15.9
2-chloroethanol	Cl—CH <sub>2</sub> —CH <sub>2</sub> —OH	5.0 x 10 <sup>-15</sup>	14.3
2,2,2-trichloroethanol	Cl <sub>3</sub> C—CH <sub>2</sub> —OH	6.3 x 10 <sup>-13</sup>	12.2
isopropyl alcohol	(CH <sub>3</sub> ) <sub>2</sub> CH—OH	3.2 x 10 <sup>-17</sup>	16.5
t-butyl alcohol	(CH <sub>3</sub> ) <sub>3</sub> C—OH	1.0 x 10 <sup>-18</sup>	18.0
cyclohexanol	C <sub>6</sub> H <sub>11</sub> —OH	1.0 x 10 <sup>-18</sup>	18.0
phenol	C <sub>6</sub> H <sub>5</sub> —OH	1.0 x 10 <sup>-10</sup>	10.0
	<i>Comparison with other acids</i>		
water	H <sub>2</sub> O	1.8 x 10 <sup>-16</sup>	15.7
acetic acid	CH <sub>3</sub> COOH	1.6 x 10 <sup>-5</sup>	4.8
hydrochloric acid	HCl	1.6 x 10 <sup>+2</sup>	-2.2

6. **ábra.** Alkohokok savi-disszociációs állandója, ill. savi-exponense.