

CHEMISTRY 161/163

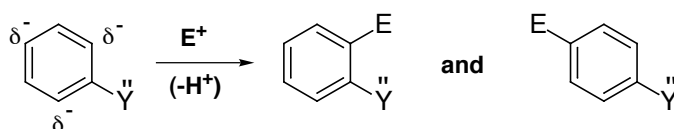
Directing Effects in Electrophilic Aromatic Substitution

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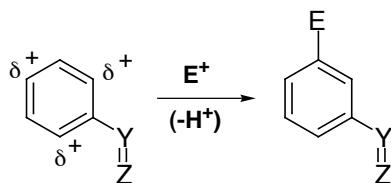
Two major effects play a role – resonance effect and inductive effect

Resonance Effect: Through π (double bond) system
Strong effect
Can be e^- Donating (ortho-para directing) or Withdrawing (meta directing)

Resonance Donating Effect (ortho-para directing, activates - i.e. more reactive than benzene)
recognize by lone pair of e^- on atom directly attached to aromatic ring

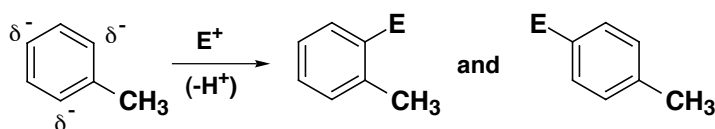


Resonance Withdrawing Effect (meta directing, deactivates - i.e. less reactive than benzene)
recognize by double bond (often with Z=oxygen) conjugated to aromatic ring

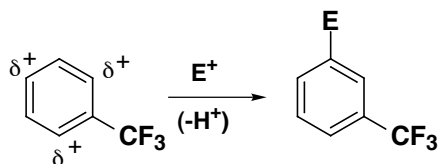


Inductive Effect: Through σ (single bond) system
Weak effect
Can be e^- Donating (ortho-para directing) or Withdrawing (meta directing)

Inductive Donating Effect (ortho-para directing, activates - i.e. more reactive than benzene)
often alkyl group



Inductive Withdrawing Effect (meta directing, deactivates - i.e. less reactive than benzene)
often haloalkyl group



Multiple Substituents: Position of reaction is controlled by strongest donating group
substitution between meta substituents rare (very difficult because of steric crowding)