

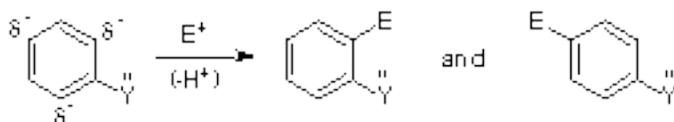
ELECTROPHILIC AROMATIC SUBSTITUTION REACTIONS

Two major effects play a role:

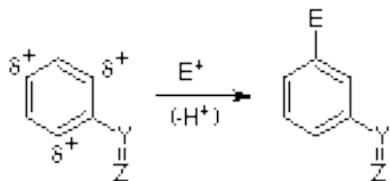
- Resonance Effect
- Inductive Effect

Resonance Effect

- Through pi (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)
 - ⇒ can often be recognized by lone pair of e- on atom directly attached to aromatic ring

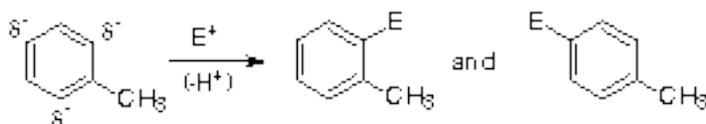


- **Resonance Withdrawing Effect:**
 - ⇒ meta directing, deactivates (i.e. less reactive than benzene)
 - ⇒ it can often be recognized by double bond (often with Z=oxygen) conjugated to aromatic ring

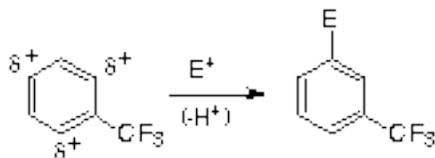


Inductive Effect

- Through sigma (single bond) system
- Weaker 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 caused by an alkyl group



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



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