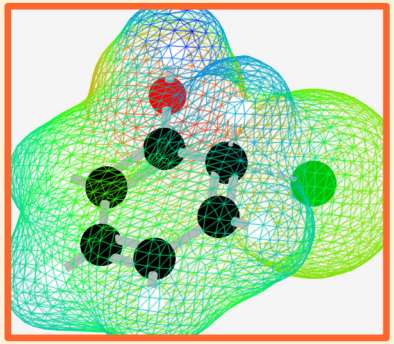
HIGHLIGHTS

- Naming the positions of the ring.
- Strongly activating groups are *ortho,para*-directing and involve the conjugation of a lone pair of electrons.
- Weakly activating groups are *ortho,para*-directing but tend to be less selective. They involve the inductive effect.
- Strongly deactivating groups are conjugated with the ring but remove electron density. They are *meta*-directing.
- Weakly deactivating groups are inductively electron withdrawing. They are meta-directing but with less selectivity.
- Halides are deactivating but *ortho,para*-directing.



The addition of a substituent onto a benzene ring has two effects on electrophilic aromatic substitution. It alters the reactivity, either ***activating*** the ring, making reactions faster and more easy, or ***deactivating the ring***. The substituent also controls the position of the reaction (it controls the ***regioselectivity***).

Electron donating groups activate the ring either by delocalization of a conjugated lone pair, or through σ conjunction. They are ***ortho,para***-directing.

Electron withdrawing groups behave in the opposite manner. They deactivate the ring and direct to the ***meta*** position. Again, either delocalization or the inductive effect drag electrons from the ring.

Halides are a pain. They are deactivating but *ortho,para*-directing.

CHEMISTRY CLASSICS

π NUCLEOPHILES PART 5

ACTIVATION AND DIRECTING EFFECTS IN S_EAr

S_EAr - Activation & directing

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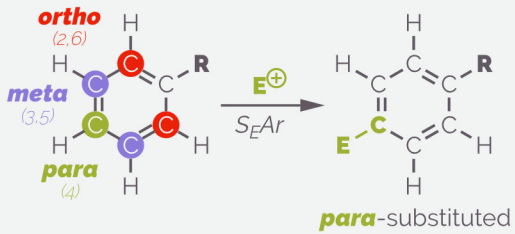
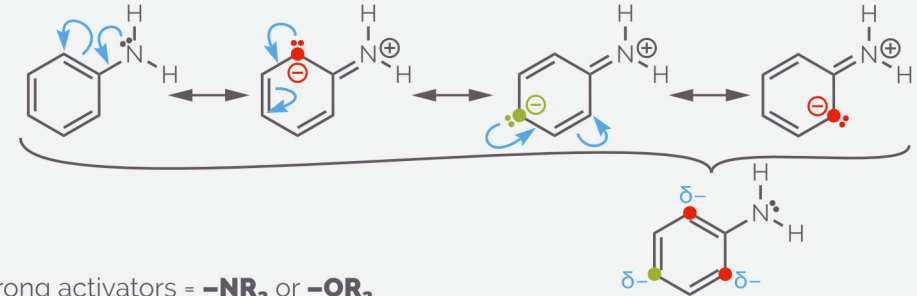
1. Introduction

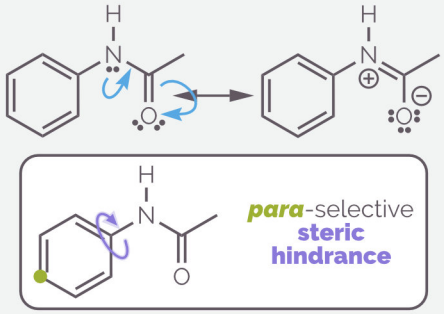


- Reaction can occur at 3 positions
- Named relative to original substituent

2. Strong activating groups

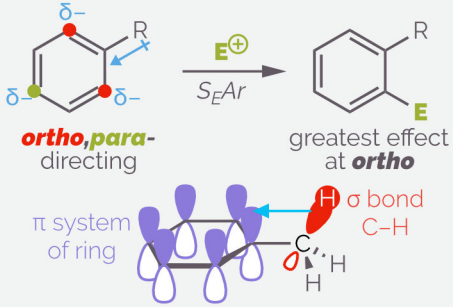


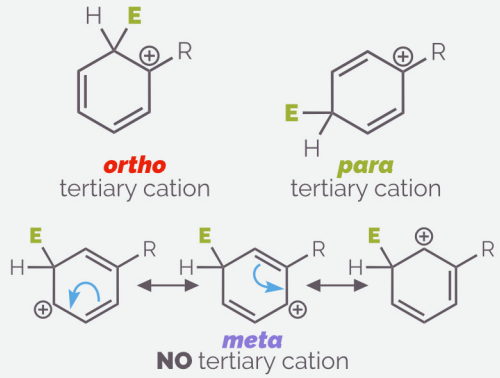
- Strong activators = **$-NR_2$** or **$-OR_2$**
- Strong activators **donate lone pair** by conjugation
- Strong activators are ***ortho,para***-directing



- Control reactivity by forming amides/ esters - steric hindrance favors ***para***

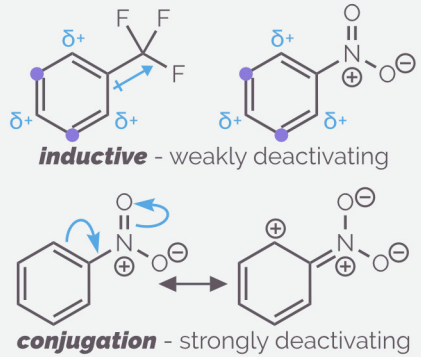
3. Weak activators

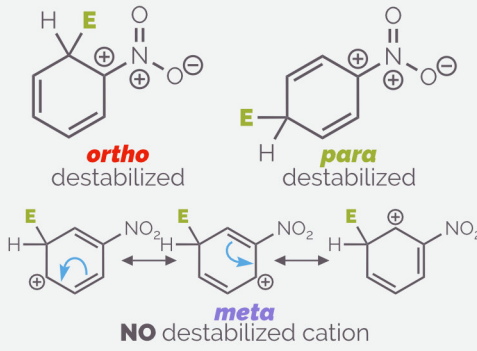




- Weak activators - alkyl groups
- Inductive effect or σ conjugation
- Stability of carbocation intermediate

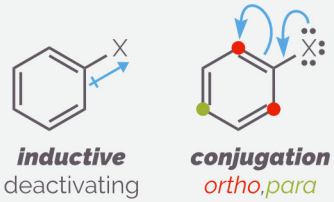
4. Deactivating groups





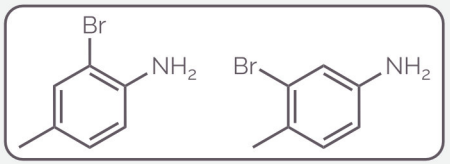
- ***Meta***-directing as least deactivated C
- ***Meta***-directing as no destabilized cation

5. Halides



- Weakly deactivating
- ***Ortho,para***-directing

6. Example



- How can each regioisomer be selectively formed?
- Use directing group effects and functional group interconversion