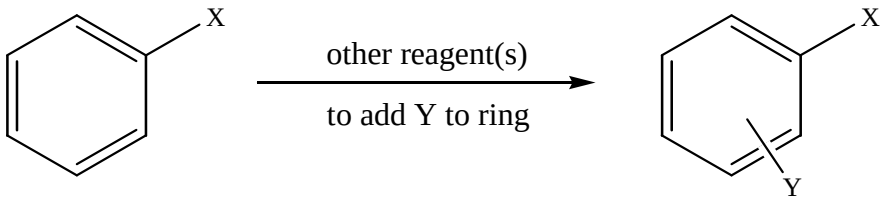
Electrophilic Aromatic Substitution of Benzene Derivatives



Substituent (X)	Reactivity	Orientation	Inductive effect	Resonance effect
Alkyl	Activating	Ortho, para	Weak, e^- donating	None
-OH $-NH_2$	Activating	Ortho, para	Weak, e^- withdrawing	Strong, e^- donating
Halogen (F, Cl, Br, I)	Deactivating	Ortho, para	Strong, e^- withdrawing	Weak, e^- donating
$-N^+(CH_3)_3$	Deactivating	Meta	Strong, e^- withdrawing	None
$-NO_2$, -CN, -CHO, CO_2R $COCH_3$	Deactivating	Meta	Strong, e^- withdrawing	Strong, e^- withdrawing

Notes:

1. Halogens and groups containing a highly electronegative atom that is ***not*** attached directly to the ring will **deactivate** the ring.
2. Some substituents have the inductive effects and resonance effects working against each other (e.g. -OH, $-NH_2$, halogens). The stronger effect wins out.
3. There are no known groups the are meta directing as well as activating.
4. Halogens are the only type of substituent that are ortho-para directing and deactivating. All other deactivators are meta directing.