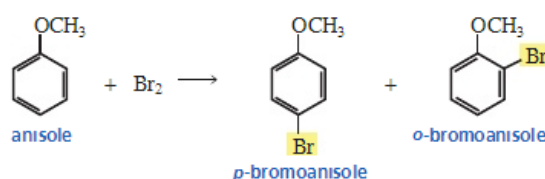


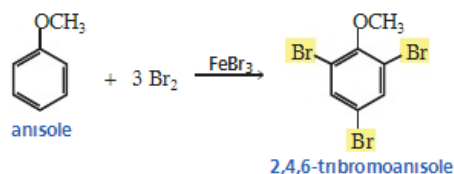
19.18 ADDITIONAL CONSIDERATIONS REGARDING SUBSTITUENT EFFECTS

It is important to know whether a substituent is activating or deactivating in order to determine the conditions needed to carry out a reaction. Halogenation is the fastest of the electrophilic aromatic substitution reactions, so halogenation should be carried out without the Lewis acid catalyst (FeBr₃ or FeCl₃) if the ring has a strongly activating substituent.

Why is halogenation the fastest one?

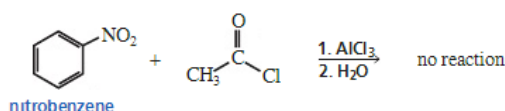
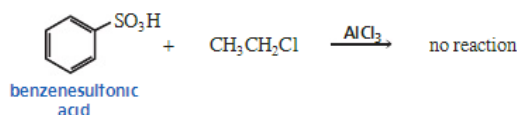


If the Lewis acid catalyst and excess bromine are used, the tribromo compound is obtained.



Friedel-Crafts reactions are the slowest of the electrophilic aromatic substitution reactions. Therefore, if a benzene ring has been moderately or strongly deactivated—that is, if it has a meta-directing substituent—it will be too unreactive to undergo either Friedel-Crafts acylation or Friedel-Crafts alkylation. In fact, nitrobenzene is so unreactive that it is often used as a solvent for Friedel-Crafts reactions.

A benzene ring with a meta director cannot undergo a Friedel-Crafts reaction.



Why is Friedel-Crafts reaction the slowest? And why is it so slow that it cannot undergo meta substitution electrophilic reactions?