What does and doesn't work in Friedel-Crafts reactions?

Friedel-Crafts is the most difficult aromatic substitution reaction to accomplish.

1. If your ring is significantly deactivated the Friedel-Crafts reaction will not work.



Basic Rule: most meta-directors cannot do Friedel-Crafts

2. Most activating groups work very well with Friedel-Crafts reactions. One exception is amines such as in aniline.



Problem: The N lone pair is more Lewis basic than the halogen lone pair so it reacts preferentially with the $AICI_3$. This ties up the catalyst so that it cannot react with the halogen to form the desired active electrophile.



Does not successfully undergo Freidel-Crafts

So why can you do Friedel-Crafts when an amide is present (the N still has a lone pair)?



although the N has a lone pair, it is sufficiently tied up in resonance with the carbonyl that it is not reactive enough as a Lewis base to react with the $AICI_3$. Thus, the $AICI_3$ remains available to generate the active electrophile for the Friedel-Crafts reaction.

Will successfully undergo Friedel-Crafts

3. Even if you do have a deactivating group, having a strong or moderate activating group on the ring will sufficiently overpower the deactivating effect, allowing a Friedel-Crafts reaction to take place.

