Friedel-Crafts Alkylation and Acylation

Friedel-Crafts Alkylation

\[
\text{C}_6\text{H}_5\text{Cl}\overset{\text{AlCl}_3}{\longrightarrow}\text{C}_6\text{H}_4\text{H}_3\text{C}
\]

Limitations of the F-C Alkylation

- Reaction is not successful on deactivated rings.
- Difficult to stop at one addition, because the product is more activated than the starting material.
- Alkyl Halides only (not aryl or vinyl halides) because carbocation must be formed as alkylating agent.
- Skeletal rearrangements of alkylating agent often occur

Acylation

\[
\text{C}_6\text{H}_5\text{C}_\text{CH}_3\overset{\text{AlCl}_3}{\longrightarrow}\text{C}_6\text{H}_4\text{H}_3\text{C}
\]

Friedel-Crafts acylation is frequently followed by reduction of the carbonyl (C=O). Note the change in directing effects after reduction, which can be useful in synthetic planning.

Limitations

- Acyl halides only: acylium ion must be formed as alkylating agent.
- Reaction not successful on deactivated rings.
- Not difficult to stop at one addition: Product is less activated than starting material
- Skeletal rearrangements of alkylating agent never occur: acylium ion is more stable than most alkyl cations--it's already downhill.

Example Reactions