Fischer esterification is the esterification of a Carboxylic acid by heating it with an alcohol in the presence of a strong acid as the catalyst.

\[
\begin{align*}
R^\cdot O^\cdot H + H^\cdot O^\cdot R' & \xrightarrow{H_2SO_4} R^\cdot O^\cdot R' + H_2O
\end{align*}
\]

Going from reactants to products simplified

Example

\[
\begin{align*}
\text{OHCH}_3 + \text{H}_2\text{SO}_4 & \xrightarrow{\text{Add the alcohol with one hydrogen removed}} \text{OHCH}_3 + \text{H}_2\text{SO}_4 \\
\text{OHCH}_3 + \text{H}_2\text{SO}_4 & \xrightarrow{\text{Add the alcohol with one hydrogen removed}} \text{OHCH}_3 + \text{H}_2\text{SO}_4
\end{align*}
\]

Mechanism

The overall reaction is reversible; to drive the reaction to completion, it is necessary to exploit Le Châteliers principle, which can be done either by continuously removing the water formed from the system or by using a large excess of the alcohol.

1) Protonation of the carbonyl by the acid. The carbonyl is now activated toward nucleophilic attack.

\[
\begin{align*}
\cdot O^\cdot H & \xrightarrow{B} \cdot O^\cdot H + :B^\cdot
\end{align*}
\]

2) Nucleophilic attack on the carbonyl

\[
\begin{align*}
\cdot O^\cdot H & \xrightarrow{B} \cdot O^\cdot H + :B^\cdot
\end{align*}
\]

3) Proton transfer

\[
\begin{align*}
\cdot O^\cdot H & \xrightarrow{B} \cdot O^\cdot H + :B^\cdot
\end{align*}
\]
4) Water leaves

5) Deprotonation

Contributors

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