

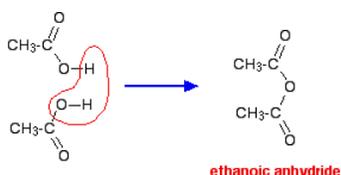
## 20.18: Reactions of Anhydrides

This page explains what acid anhydrides are and looks at their simple physical properties such as boiling points. It introduces their chemical reactivity in a general way. A **carboxylic acid** such as ethanoic acid has the structure:



ethanoic acid

If you took two ethanoic acid molecules and removed a molecule of water between them you would get the acid anhydride, ethanoic anhydride (old name: acetic anhydride).

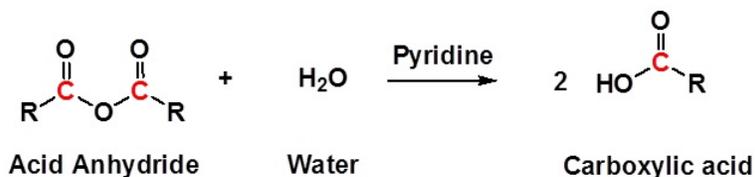


ethanoic anhydride

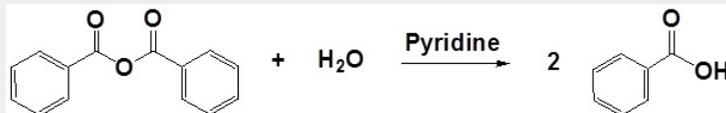
You can actually make ethanoic anhydride by dehydrating ethanoic acid, but it is normally made in a more efficient, round-about way

**Acid Anhydrides react with water to form carboxylic acids**

**General Reaction**

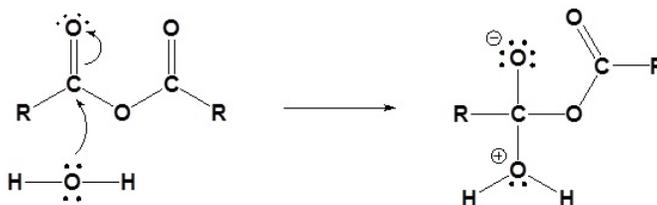


Example 1:

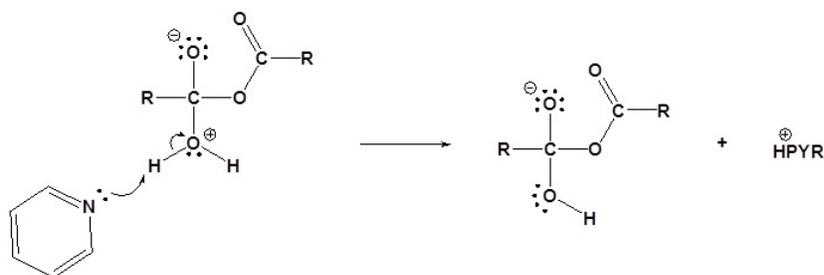


**Mechanism**

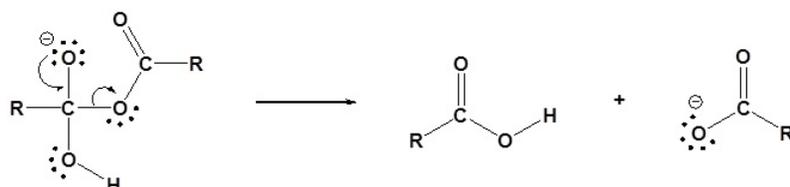
1) Nucleophilic Attack by the water molecule



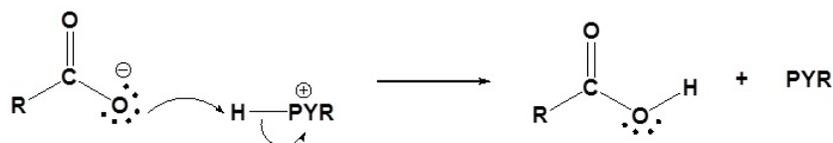
2) Deprotonation by pyridine



3) Leaving group removal

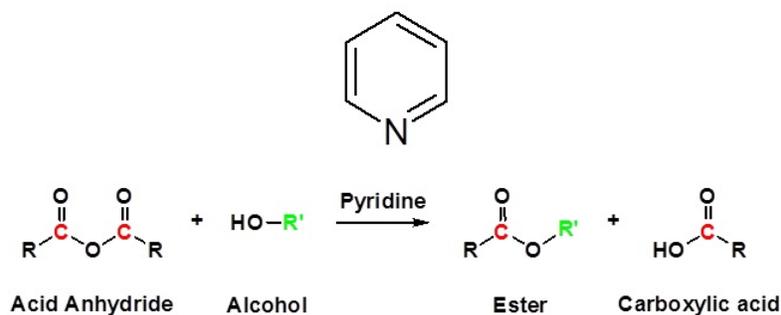


4) Protonation of the carboxylate

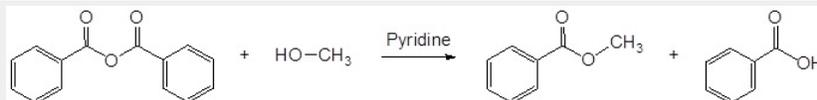


## Acid Anhydrides react with alcohols to form esters

Reactions of anhydrides use Pyridine as a solvent

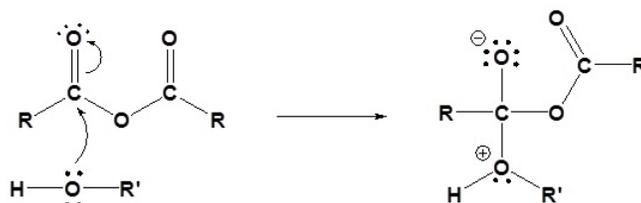


Example 1:

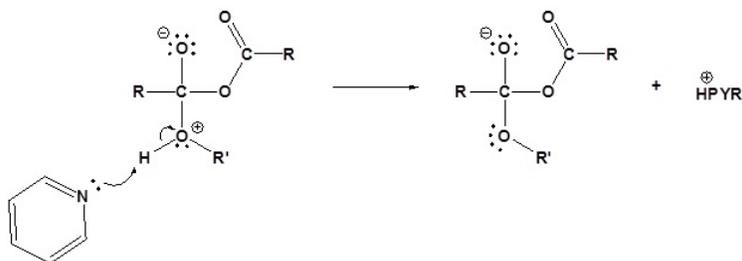


## Mechanism

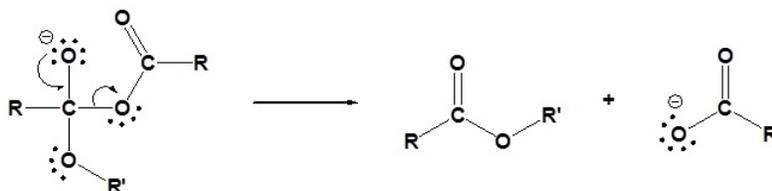
1) Nucleophilic Attack by the Alcohol



## 2) Deprotonation by pyridine



## 3) Leaving group removal

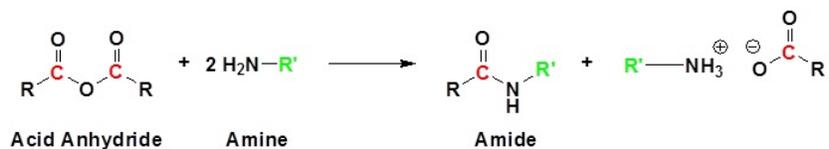


## 4) Protonation of the carboxylate

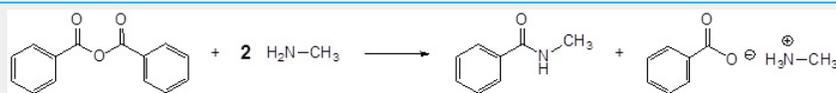


Acid Anhydrides react with amines to form amides

### General Reaction

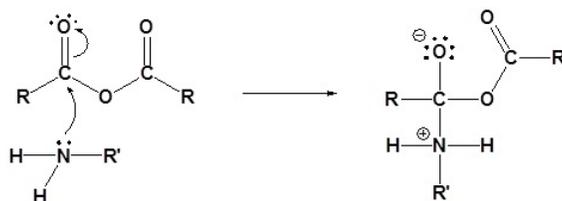


#### Example 1:

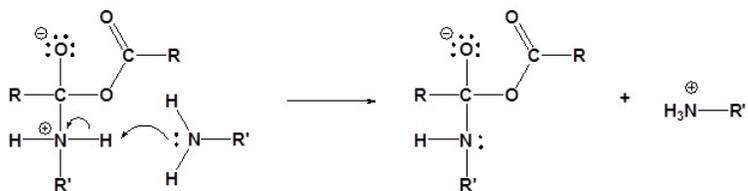


### Mechanism

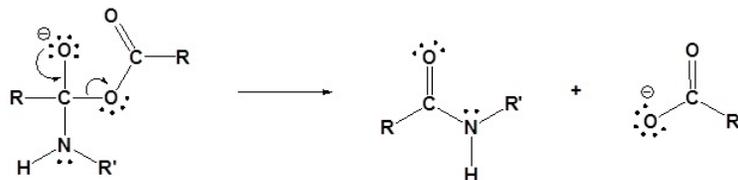
#### 1) Nucleophilic Attack by the Amine



#### 2) Deprotonation by the amine



3) Leaving group removal



## Contributors

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