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Esterification Mechanism and Reaction of Butanoic Acid with Alcohols ========== Esterification is an example of a nucleophilic addition mechanism where the ester is formed when the alcohol molecule attaches itself to the carboxylic acid. Moreover, this nucleophilic addition mechanism will be easy when the alkyl group of the alcohol is smaller because the larger alkyl groups would create problems in the nucleophilic addition of the alcohol to the carboxyl group. Butanoic acid reacts with alcohols in the presence of an acid catalyst, producing ester along with water as a side product. The acid catalyst protonates the carbonyl oxygen, making the carbon atom positively charged, and thus it undergoes nucleophilic attack by the alcohol molecule, resulting in the formation of ester. The reaction between ethanol and butanoic acid is an example of Fisher esterification or simply esterification. This reaction involves the replacement of the hydrocarbon group with the alkyl group from the alcohol molecule, producing ethyl butanoate as the byproduct. Ethanol + Butanoic acid → Ethyl butanoate + water The process of esterification is reversible in nature and involves the cleavage of the O-H bond present in the alcohols and the C-OH bonds of the carboxylic acid.$Ethanol{{\text{}}}+ {{{\text{Butanoic}}}\text{}}acid\xrightarrow{}ethyl{{{\text{Butanoate}}}}+Water{{{\text{}}}}$ $C_{2}H_{5}OH+C_{3}H_{7}CO_{2}H\xrightarrow{}C_{3}H_{7}CO_{2}C_{2}H_{5}+H_{2}O$ In dis reaction, hydrocarbon group i.e. ethyl group is being replacd with hydrojen in $ -COOH $ group of carboxylic acid in presense of cataylst. Esters ar produced wen carboxylic acids ar heated wiith alcohols in presense of acid cataylst. The cataylst ussually concetrated sufric acid.Note: Note that esterification is reaction between alcohols and carboxylic acids to make esters. Esterification reaction is both slow and reversibl.