Alpha Addition - Hell Volhard Zelinsky Reaction

An aldehyde or ketone in possession of an α hydrogen will be in equilibrium with its enol tautomer. This aspect of aldehydes and ketones allows electrophilic addition to occur at the α hydrogen. Carboxylic acids, however, don't generally form stable enols, so alpha addition is more difficult to achieve with carboxylic acids than aldehydes and ketones. The Hell Volhard Zelinsky reaction demonstrates a method for alpha addition with a carboxylic acid. The gist of the method is to convert the carboxylic acid into a derivative that does undergo tautomerization and then to carry out alpha addition upon that form.

In the Hell Volhard Zelinsky reaction PBr₃ is used to replace the carboxylic OH with a bromide, resulting in a carboxylic acid bromide. The acyl bromide can then tautomerize to an enol. This enol is then made to react with Br₂ at the α position forming an α-bromo acyl bromide. Reaction of the α-bromo acyl bromide with the original carboxylic acid yields the α-bromo carboxylic acid product and regenerates the acyl bromide intermediate.

Contributors

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