

Study Notes On Wittig Reaction



WITTIG REACTION

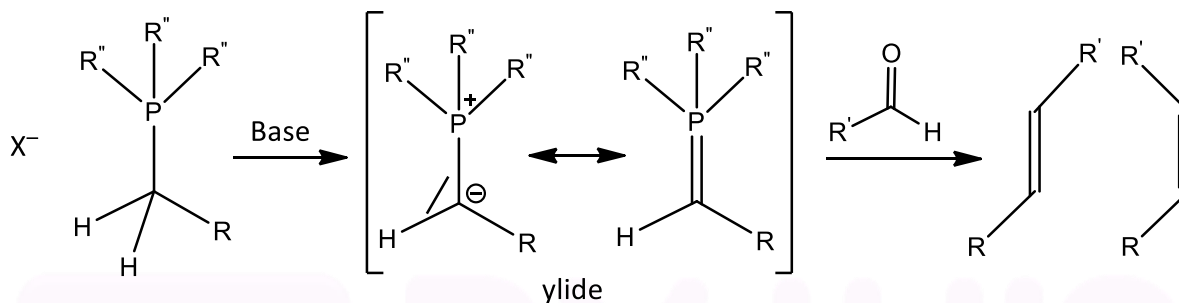
This reaction is named after scientist Georg Wittig. It is also known as Wittig Olefination. It is a type of coupling reaction where an aldehyde or ketone reacts with triphenyl phosphonium ylide to yield alkene and a triphenylphosphine oxide.

Solvents used in this reaction are typically THF or diethyl ether.

Phosphonium ion generates ylide. The geometry of resulting alkene depends upon the reactivity of ylide. If 'R' is an electron withdrawing group, then the ylide is STABILISED and it is not as reactive as when 'R' is an alkyl group.

The stabilized ylide predominantly gives (E)-alkene whereas, non-stabilized ylide gives (Z)-alkene.

General reaction-



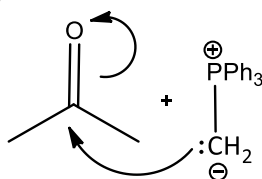
Reaction Mechanism-

A four membered cyclic intermediate (an oxaphosphetane) is formed as a result of [2 + 2] cycloaddition of ylide to the carbonyl group of substrates.

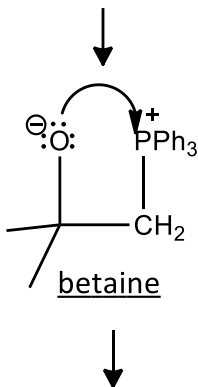
Firstly, a betaine is formed as a zwitterionic intermediate, which in turn leads to the formation of the oxaphosphetane.

Betaines may be stabilized by lithium salts which leads to side products; suitable bases in the Wittig reaction are NaOH, NaOMe, NEt₃.

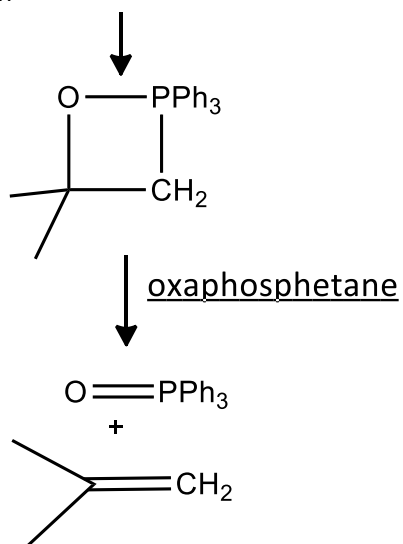
Step 1: Attack of ylide Carbon on carbonyl



Step 2: Attack of oxygen on phosphorus

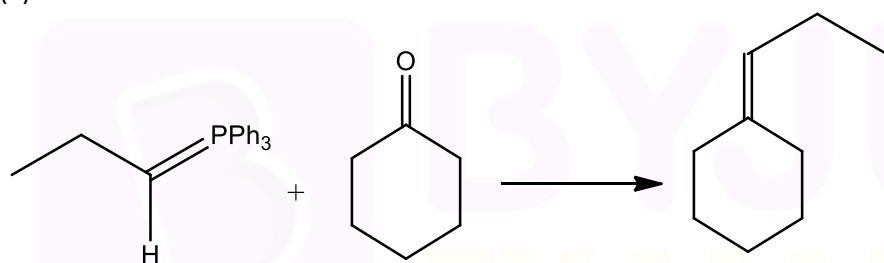


Step 3: Reverse [2 + 2] cycloaddition

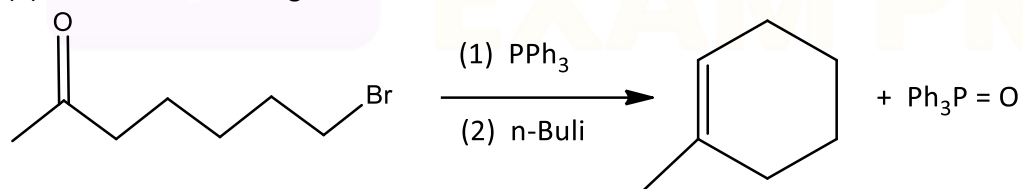


Examples:

(a)



(b) Intramolecular Wittig reaction:



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