SYNLETT
Spotlight 138

This feature focuses on a reagent chosen by a postgraduate, highlighting the uses and preparation of the reagent in current research

Phosphorus Pentoxide

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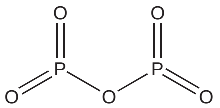
Introduction

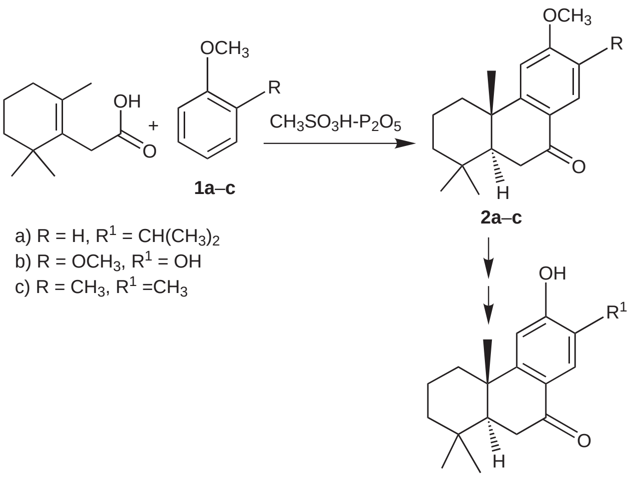
Phosphorus pentoxide is a white, flammable, and extremely deliquescent solid. Its structure consists of each P atom linked with five valence electrons to three oxygen atoms.



P_2O_5 reacts violently with water to produce phosphoric acid and is therefore a versatile acidic dehydrating agent. It is a very well-known and much-used reagent and has many applications in organic synthesis. Recently, its use has been reported in several types of reactions, mostly in order to improve reaction methods. The advantages are that it is an inexpensive and selective reagent, which gives high yields in simple operations under solvent-free conditions and short reaction time.[1] It is used in the synthesis of nitriles[2,3] from aldoximes,[1] for oxidation of alcohols to ketones and aldehydes.[4] Is a highly efficient reagent for the acetylation of a variety of alcohols, phenols and amines with acetic anhydride under solvent-free conditions. Primary, secondary, allylic and benzylic alcohols, diols and phenols with electron-donating or -withdrawing substituents can be easily acetylated in high yield.[5] In addition, it is used to synthesize phosphorus compounds[6] and polymers.[7]

Abstracts

(A) New types of concerted domino acylation-cycloalkylation reactions promoted by methanesulfonic acid-phosphorus pentoxide, provide efficient, elegant, and expeditious routes for biologically active naturally occurring diterpenoids, namely (±)-ferruginol (**3a**), (±)-nimbidiol (**3b**), (±)-nimbiol (**3c**) (75–90%).[8] This exceptionally short as well as stereoselective route to the total synthesis of diterpenes involve a one-pot reaction method unlike the literature methods commonly used for this type of compounds.



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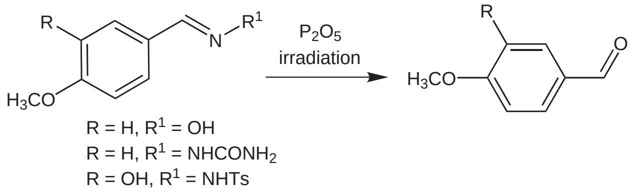
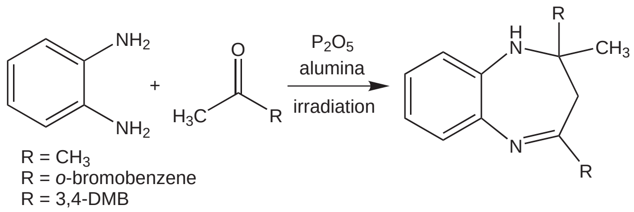
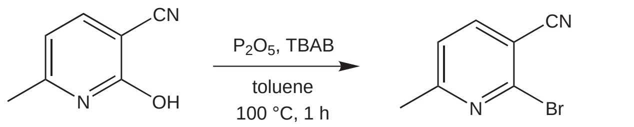
(B) Microwave irradiation of oximes, semicarbazones, phenylhydrazones and tosylhydrazones of various aldehydes in the presence of phosphorus pentoxide provides a fast, efficient and simple method for regeneration of aldehydes in high yield (68–98%).[9]



(C) Microwave irradiation of phosphorus pentoxide supported in alumina was found to be an efficient reagent for the synthesis of 1,5-benzodiazepine derivatives from phenylenediamine and ketones. This method is an easy, rapid, solvent-free and high-yielding reaction for the synthesis of 1,5-benzodiazepines (75–85%).[10]



(D) Bromination of hydroxyheteroarenes using P_2O_5/Bu_4NBr proceeds under mild conditions to afford high yields of various bromoheteroarenes. In general, these compounds have been prepared with PBr_3 or $POBr_3$, but those bromination procedures have some disadvantages such as handling of hazardous reagents, exact reaction-temperature control and evolution of toxic HBr. The P_2O_5 procedure is successfully applied to large-scale synthesis of bromoheteroarenes (75%).[11]



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