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Ammonium carbonate: As a dual source reagent

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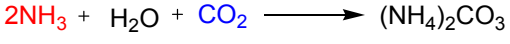
This feature focuses on a reagent chosen by a postgraduate, highlighting the uses and preparation of the reagent in current research.

Introduction

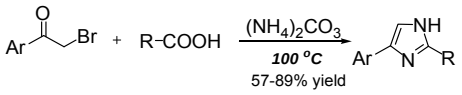
Since that, the application of gases in organic synthesis have been widely studied and on the other hands their using needs specific precautions. Therefore, any efforts for finding reagents which could be acts as an *in situ* sources for producing of synthesis gases should be more demand. As we know that, any stable salts such as: $(NH_4)_2CO_3$ which could be acts as a dual source for producing of both of NH_3 and CO2 are more valuable and interested. Ammonium carbonate had been reported at the beginning of the 14th century. It was produced by dry distillation of antlers, hooves, and leather, but nowadays it produce by following methods (scheme1) [1]. This could be decomposed and produced gaseous ammonia and carbon dioxide when placed in moisture and heated respectively. Thus, it should be stored in sealed and metal free containers and in cool places. Using ammonium carbonate provide some advantages such as, non-toxic, commercial availability and more solubility in the water. It is colorless or pale white solid with strong smell ammonia and melting point 58 $^{\circ}$C which also called baker's ammonia, salt volatile and salt of hartshorn [1]. It has been applied as a reagent and/or catalyst in the manufactory, blowing agent in foam rubber and foam plastics [1]. The described reagent has been also used for the synthesis of various organic compounds such as: 2-alkyl-4(5)-aryl-1H-imidazoles [2], 1,4-dihydropyridines (1,4-DHPs) [3], Monothiohydantoin [4], nitriles [5], Hydantoins [6].



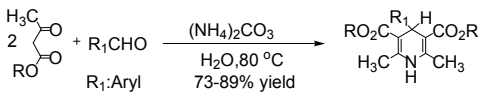
Scheme 1.

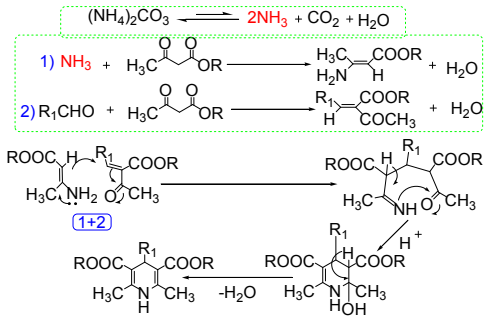
Abstracts

(A) Cong liu and *et.al* described an efficient and convenient method for the one-pot synthesis 2-alkyl-4(5)-aryl-1*H*-imidazoles by using cyclocondensation from α-bromo aryl methyl ketones, aliphatic carboxylic acids and ammonium carbonate without using any catalyst. Firstly the organic acids and ammonium carbonate produced organic amides at high temperature, then the amide reacted with added 2-bromo-1-phenylethanone to give corresponding imidazole. Imidazole moieties has been used as core center for the synthesis of ionic liquids, anti-nociceptive agents, anti-hypertensive drugs [2] and so on.

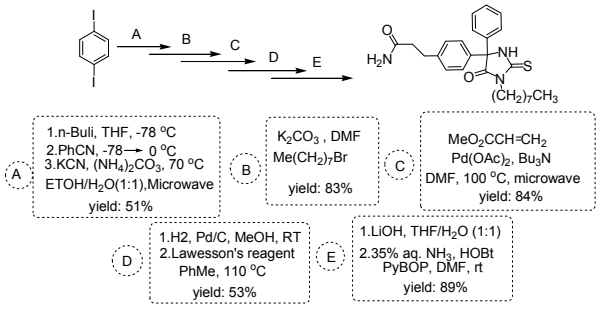


(B) Ammonium carbonate has been also used as a source of ammonia for the synthesis of various 1,4-dihydropyridines (1,4-DHPs) moieties in excellent yields. 1,4-DHPs were synthesized through multicomponent reaction of ethyl acetoacetate, aryl aldehyde and ammonium carbonate (mole ratio = 2:1:1) [3]. Since ammonium carbonate is very sublimable, it has been used only in water as the solvent.

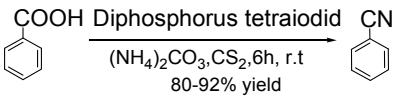


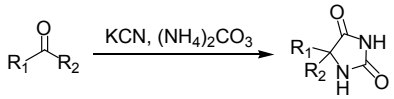


(C) Mono thiohydantoin as an inhibitor of fatty acid amide hydrolase was synthesized from 1,4-diiodobenzene in seven-step. The key step in the sequence involves the formation 5,5-disubstituted hydantoin nucleus by microwave irradiation (step A) [4] . As has been shown, ammonium carbonate used as a dual source of both of ammonia and carbon dioxide for the synthesis of the precursor of the above mentioned drug.

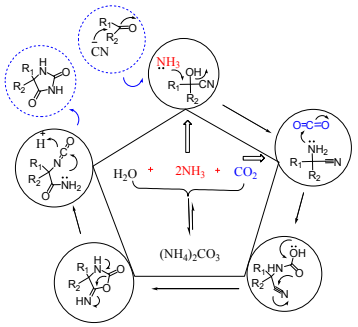


(D) Nitriles were prepared *via* mild and convenient method, from carboxylic acids by using diphosphorus tetraiodide and ammonium carbonate in various anhydrous solvents such as acetonitrile, chloroform, dichloromethane, carbon disulfide, perchloromethane without using any catalyst at room temperature [5].





(E) Hydantoins moieties has been used as biological core in various drugs, such as anticonvulsants [7], antiarrhythmic [8], anti-diabetics [9], serotonin, and fibrinogen receptor antagonists [10]. A good range of hydantoins were obtained through multicomponent reaction by using of potassium cyanide, ammonium carbonate and kethones. The mentioned described method has been known as Bucherer-Bergs reaction [6].



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