

Synthesis of cyanohydrin trimethylsilyl ethers catalyzed by potassium *p*-toluenesulfinate

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Abstract

Potassium *p*-toluenesulfinate was found to be an effective and easily accessible Lewis basic catalyst for the facile cyanosilylation of carbonyl compounds in high to quantitative yields under solvent-free conditions at room temperature.

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1. Introduction

Cyanohydrins and their trimethylsilyl ethers are key building blocks for the one-step synthesis of many biologically active compounds [1–3], ferroelectrics and liquid crystals [4] that are otherwise only obtained with difficulty. They can easily be converted into various functionalized α -hydroxy acids, α -hydroxy aldehydes, β -amino alcohols and other polyfunctional compounds [5]. Among various cyanating reagents such as KCN or NaCN and HCN, trialkylsilyl cyanide compounds are safe and more effective cyanide sources for nucleophilic addition to carbonyl compounds under mild conditions [6,7]. However, trimethylsilyl cyanide (TMSCN) has been used in particular for this purpose [4–8].

On the other hand, as a consequence of the necessity to minimize the amount of toxic waste and by-products from chemical processes, there is a need to develop new and more environmentally friendly synthetic methods in which fewer toxic substances are used. Nowadays in the development of new syntheses, ecological points of view must also be taken into consideration and apportioned due to impor-

tance in the assessment of viability. Many organic solvents are flammable, toxic, and volatile compounds or hazardous air pollutants [9–11]. Therefore, solvent-free synthesis is highly becoming more popular, especially in industry, because it may be both more environmentally benign and more economically feasible [12]. To the best of our knowledge, most of the introduced protocols for cyanosilylation of carbonyl compounds have been reported by using toxic solvents such as DMF [13,14], CH₃CN [15], CHCl₃ [16] or CH₂Cl₂ [6,17] and the number of methods under solvent-free conditions remains quiet limited [4]. Also, the transfer of a cyano group from TMSCN to carbonyl compounds can be catalyzed by a plethora of nucleophilic catalysts such as trisaminophosphines [7], *N*-heterocyclic carbenes [8,13,14,18], fluoride sources [15], triethylamine, tributylphosphine, triphenylarsine, triphenylantimony [13], imidazolinium-carbodithioate zwitterions [17], guanidine [19], and tetrabutylammonium cyanide [20]. However, most of these catalytic systems suffer from drawbacks such as multi-step preparation, using strong alkoxide base, high catalyst to substrate mole ratios, long reaction times, toxicity, being hygroscopic, instability under ambient conditions and tedious work-up procedures. Therefore, development of new efficient and mild catalysts which operate under solvent-free conditions is a very active research effort.

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