



Potassium phthalimide-*N*-oxyl: An efficient catalyst for cyanosilylation of carbonyl compounds under mild conditions

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Abstract

Potassium phthalimide-*N*-oxyl was used as an effective, easy to handle and readily available Lewis basic organocatalyst for the facile addition of trimethylsilyl cyanide to various carbonyl compounds at room temperature under mild conditions to afford corresponding cyanohydrin trimethylsilyl ethers in high to quantitative yields. The high yields of products, high turnover numbers of the catalyst, compatibility of other functional groups, and simplicity in the operation are the advantages of this method.

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1. Introduction

Cyanohydrins and corresponding trimethylsilyl ethers are versatile intermediates in the preparation of a wide range of pharmaceuticals, agrochemicals and insecticides [1–4]. They can easily be converted into various functionalized α -hydroxy acids, α -hydroxy aldehydes, β -amino alcohols and other polyfunctional compounds [4]. The addition of trimethylsilyl cyanide (TMSCN) to carbonyl compounds, including aldehydes and ketones is a well-established route to afford trimethylsilylated cyanohydrins of which the preparation is difficult by the traditional methods [1–17]. The reaction is catalyzed by Lewis acids [8] as well as Lewis bases [9] or double activating catalytic systems. It is therefore not surprising that many catalysts have been developed for this transformation [8–10].

On the other hand, the past few years have witnessed major advances in new catalytic methods based on organic compounds as organocatalysts to replace the traditional transition metal–ligand catalytic systems [10,11]. Hence, various organocatalysts have also been applied to catalyze addi-

tion of TMSCN to carbonyl compounds at the threshold of their application in organic synthesis [9–17]. Among them, trisaminophosphines [9], stable *N*-heterocyclic carbenes (NHCs) [10], imidazolium-carbodithioate zwitterions [11], alkali metal salts of amino acids [12], *N*-oxides and their combination with quaternary ammonium salt [13], tetrabutylammonium cyanide [14], substituted guanidines [15], tertiary amines [16], derivatives of thia-urea [17] are worthwhile to be mentioned. However, most of these catalytic systems require multi-step preparation, the use of strong bases such as potassium *t*-butoxide, high catalyst to substrate mole ratio, inert atmosphere, long reaction times and laborious work-up procedure [9–17]. Therefore, development of new catalysts which operate under milder conditions is a challenge attracting much attention.

Recently, we have reported the first catalytic cyclotrimerization of aryl and alkyl isocyanates using potassium phthalimide-*N*-oxyl (PPINO) [18]. On the basis of our previous results and to develop the catalytic scope of the phthalimide-*N*-oxyl (PINO) nucleophile, we decided to examine the feasibility and efficiency of the PINO-catalyzed cyanosilylation of carbonyl compounds. Herein, we disclose the application of PPINO as an efficient organocatalyst to the addition of TMSCN to carbonyl compounds under mild conditions affording various cyanohydrin trimethylsilyl ethers.

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