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Eco-friendly Synthesis of α -Aminonitriles Catalysed by EPZG

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ABSTRACT

A simple, proficient and ecofriendly procedure has been developed for the three component coupling of aromatic aldehyde, substituted amines and trimethylsilyl cyanide produce α -amino nitriles. The α -amino nitriles are synthesized in high yields (90-91%) in a few minutes (18-45 min) under solvent-free conditions using EPZG catalyst at room temperature.

Keywords: α -amino nitriles; EPZG; Ecofriendly; Room temperature

INTRODUCTION

Nitriles are the building blocks of most biologically active substances and natural products. However, amides and carboxylic acids [1-2] have synthesized from nitriles, due to this α -aminonitriles have occupied great position in synthetic organic chemistry, this growing demand of nitriles, satisfied by Strecker reaction [3]. Strecker in 1850 reported the synthesis of α -aminonitriles by multicomponent condensation of aldehyde, amine and hydrogen cyanide [3] hydrocyanation of emines is thus basic C-C bond formation reaction [4] involves conversion of nitriles to carbonyl group [5-6]. Modified Strecker reaction i.e. synthesis of optically active α -amino acid by the hydration of cyanide [7], α -aminonitriles is acts a precursor fragment for the synthesis of α -amino acid [8], imidazole and several biologically active compounds [9] containing nitrogen atom. Bifunctionality of α -aminonitriles acts as a building blocks of pharmaceutical industries [11], such as serine protease inhibitors [12], (-, +)phtalascidine 650 [13] and also in the synthesis of boron containing retinoids [14]. Synthesis of heterocyclic moiety such as 1,2,3-diazaphospholidines, imidazole, oxazoles, and isothiozoles [15] derived from 2-amino-2-alkyl(aryl) propanenitriles as a starting material. Synthesis of 5-amino-4H-imidazoles was achieved by reacting α -aminonitriles with imidoester which is a key material of many biological compounds. Different protocols have been reported for the synthesis of α -aminonitriles such as Formic acid [16], ammonium chloride [17], PPh₃/DEAD[18], Bicyclic Guanidine [19], polyethylene glycol (PEG-OSO₃H) [20], MgI₂ [21], sulphated polyborate [22], PEG -400 [23], Zn(CN) [24], cinchona-based thiourea alkaloid [25], 5mol % to 20mol % L-prolineamide derived N,N'-dioxide [26], Ga(OTf)₃[27], Nafion -H and NafionSAC-13 [28], SBA-15 supported sulphonic acid [29], indium (III) iodide [30], mesoporous MCM-41 catalyst [31], ionic liquid [bmim]BF₄ or MgBr₂.OEt₂ [32], Bismuth Nitrate [33], Fe₃O₄@SiO₂@Me&Et-PhSO₃H [34], Task-Specific ionic liquid [35], chiral ammonium trifluoroacetate, potassium hexacyanoferrate (II) [36], Silica based Scandium (III) [37], Pd(II) [38], magnetically separable nanoparticles [39,40]. We have reported here environmentally green EPZG as catalyst for the synthesis of α -aminonitriles. EPZG is a FeCl₃ supported on clay.

Present work

It was clear from the literature review that α -aminonitriles has greater utility in medicinal chemistry as well as in agricultural fields. we have report herein Lewis acid EPZG^R [41-51] catalyzed solvent free synthesis of α -aminonitriles at room temperature (Scheme 1) (Table 1-4).