Available online at www.derpharmachemica.com

ISSN 0975-413X
CODEN (USA): PCHHAX

Der Pharma Chemica, 2022, 14(6): 31-37
(http://www.derpharmachemica.com/archive.html)

Eco-friendly Synthesis of α -Aminonitriles Catalysed by Epzg

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Received: 06-Jun-2022, Manuscript no: dpc-22-65962, **Editor assigned**: 8- Jun-2022, PreQC No: dpc-22-65962, **Reviewed**: 22- Jun -2022, QC No: dpc-22-65962, **Revised**: 23-Jun-2022, Manuscript No: dpc-22-65962, **Published**: 30-Jun-2022, **DOI**: 10.4172/0975-413X.14.6.31-37

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 ptotocols have been eported for the synthesis of α–aminonitriles such as Formic acid [16], ammonium chloride [17], PPh_3/DEAD[18], Bicyclic Guanidine [19], polyethylene glycol (PEG-OSO_3H) [20], MgI_2 [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]BF_4 or $MgBr_2.OEt_2$ [32], Bismuth Nitrate [33], Fe_3O_4@SiO_2@Me&Et-$PhSO_3H$ [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 $FeCl_3$ 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).