

An Efficient and Convenient Synthesis of Imidazolines and Benzimidazoles via Oxidation of Carbon-Nitrogen Bond in Water Media

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The metal coordination complex $K_4[Fe(CN)_6]$ is an efficient and environmentally benign catalyst for the synthesis of imidazolines and benzimidazoles from various aldehydes and 1,2-diamines in aqueous medium at room temperature. This protocol gives excellent yield of product with desired purity.

Keywords aldehyde, 1,2-diamines, $K_4[Fe(CN)_6]$, imidazolines, benzimidazoles, water

Introduction

An efficient and convenient chemical process or method for the synthesis of biologically active compounds from the simple reagent is always a challenging task for chemists working in the field of organic synthesis. The imidazolines and benzimidazoles are the important heterocycles found in many biologically active compounds.^[1] They are biologically active pharmacophores and synthetic intermediates in medicinal chemistry^[2] (Figure 1). They are also used as chiral catalysts,^[3] chiral auxiliaries,^[4] and ligands for asymmetric catalysis.^[5] It is a continuation of our interest in the synthesis of these heterocycles due to their broad spectrum of biological activities including antihyperglycemic,^[6] antiinflammatory,^[7] antihypertensive,^[8] anticancer,^[9] and antihypercholesterolemic^[10] agents. In addition, they have also shown excellent biological activities like antiulcer, antiviral, antifungal, antibacterial, antitubercular, antiasthmatic, anti-diabetic and antiprotozoal.^[11-19]

In recent years, potassium ferro-cyanide has gained special attention as a catalyst in organic synthesis like synthesis of anti-Alzheimer drug (–)-Galanthamine^[28] due to its high stability, oxidizing power selectivity and a nontoxic byproduct Fe(III). It is useful to promote oxidative cyclization of 5-*S*-Cysteinyldopa.^[29] Xiao *et al.*^[30] studied the liberation of cyanide into the environment which has terrestrial importance for ecosystem and Gaffar *et al.*^[31] studied the kinetics of the potassium ferro cyanide. Because of many advantages such as excellent solubility in water, uncomplicated handling, inexpensiveness and eco-friendly nature, readily avail-

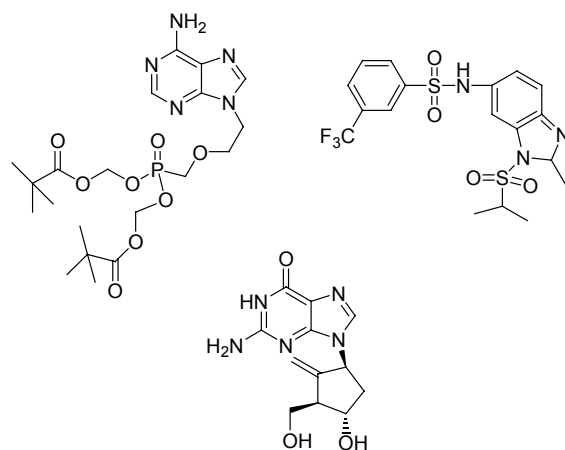


Figure 1 Structures of biologically active compounds containing imidazole pharmacophore

able and highly reactive potassium ferrocyanide is used as a green, efficient and environmentally friendly catalyst for the development of various synthetic methods.

Nowadays, several methods have been developed, for the synthesis of benzimidazoles in presence of various catalyst such as sulfur/ultrasonic,^[20] homogeneous Lewis acids,^[21] $I_2/KI/K_2CO_3/H_2O$,^[22] pyridinium-*p*-toluenesulfonate,^[23] ionic liquids,^[24] polyaniline-sulfate,^[25] (bromodimethyl)sulfonium bromide^[26] and Zeolites.^[27]

However, all of the synthetic protocols reported so far suffer from disadvantages such as, use of organic solvents,^[21,23,25] harsh reaction conditions,^[22,26] elevated temperature,^[22] prolonged reaction times,^[23,25] use of expensive reagents.^[21,24] To overcome all these disadvantages herein we report a practical, inexpensive and

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