

Investigation of simple and accurate method for synthesis of 2, 4, 5-triaryl-1H-imidazole derivatives using SiO₂-NaHSO₄ under solvent-free condition

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Abstract

This paper presents a mixture of benzyl, aromatic aldehyde and ammonium acetate in presence of SiO₂-NaHSO₄ under solvent-free condition were converted to 2, 4, 5-Triaryl-1H-Imidazoles. The short reaction time, cleaner reaction, and easy workup make this protocol practical and economically attractive. We have had the option to present a proficient and earth inviting for the union of imidazole subsidiaries by means of buildup of benzil with different sweet-smelling aldehydes and ammonium acetic acid derivation. Subsequently, revealed SiO₂-NaHSO₄ as impetus which could give an effective, modest, simple partition, high return and basic course under dissolvable free condition for the union of imidazoles.

Keywords: SiO₂-NaHSO₄, triaryl, benzyl, imidazoles

Introduction

Multicomponent responses (MCRs) alludes to a response wherein at least two fixings are consolidated inside a solitary cycle and the items they make, which is important for all the parts are present. Since the multi-component reactions for the synthesis of organic compounds and these compounds can be used as a drug and precursor multicomponent reactions, so to investigate them out is important [1-4].

Imidazoles are important heterocycle compounds in medicinal chemistry. Imidazoles widely have been used of biological activity which has made them privileged structures in combinational drug discovery libraries. They have the biological roles and also found application as a chromophore with high extinction coefficient, readily tunable absorption wavelength, and fluorophoric properties and was desirable as a large planer synthetic building block in supramolecular chemistry. Recently, several improved methodologies have been developed that use HY/silica gel, acidic Al₂O₃, AcOH, ionic liquid, NH₄OAc, sodium bisulfate among others [5-8]. Previously, we have synthesized a number of heterocyclic compounds [9-17]. In this investigation, we have utilized of SiO₂-NaHSO₄ as an impetuses to build up another and simple procedure for the blend of 2, 4, 5-triaryl imidazole subsidiaries. The examinations were begun with the investigation of one-pot, a straightforward, gentle and productive technique for the planning of the 2, 4, 5-triaryl imidazoles by utilizing SiO₂-NaHSO₄ as an impetus (Scheme - 1)

Experimental

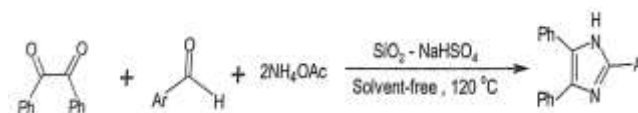
All chemicals were obtained from Merck of Fluka without further purification. Silica gel SILG/UV 254 plates were used for TLC. IR spectra were measured on a Shimadzu IR-470 Spectrophotometer. ¹H NMR spectra were determined on Bruker 500 DRX AVANCE instrument at 500 MHz, respectively.

General procedure for preparation of 2a-I

A mixture of aldehyde (1 mmol), benzyl (1 mmol), ammonium acetate (3 mmol) and SiO₂-NaHSO₄ (10 mol%) as a catalyst was stirred at 120°C for 30 min. The progress of reaction was monitored by TLC. After finishing, recrystallized from ethanol 95% to give pure products (A1-A4)

Spectral data 2, 4, 5-Triphenyl-1H-imidazole (A1)

Pale yellow crystals, Yield: 0.26 g (89%) mp: 274-276°C. IR (λ_{max}[cm⁻¹])(KBr): 3400(NH Str.); ¹H NMR(400.13 MHz CDCl₃)δ(ppm): 7.39-7.85(10H, m, CH_{arom}); 7.98-8.0(2H, d, j=8Hz, 2CH); 8, 10(1H, s,CH).



Results and Discussion

We have had the option to present a proficient and earth agreeable for the combination of imidazole subsidiaries by means of buildup of benzyl with different sweet-smelling aldehydes and ammonium acetic acid derivation. 3000 (CH_{arom} Str.); 1600(C=C Str.); 1470(C=N Str.). ¹H NMR (400.13MHz CDCl₃)δ (ppm): 7.22-7.49(14H, m, CH_{arom}), 7.94(2H, d, J=8Hz,2CH), 9.40(H,s, NH).

2-(4-chlorophenyl)-4, 5-diphenyl-1H-imidazole (A2)

Bright crystals, Yield: 0.28 g (85%, mp: 260-262°C. IR (λ_{max}[cm⁻¹]) (KBr): 3400(NH Str.); 3000(CH_{arom} Str.); 1600(C=C Str.); 1500 (C=N Str.). ¹H NMR (400.13 MHz CDCl₃) δ (ppm): 7.09-7.84 (11H, m, CH_{arom}), 7.82-7.84 (2H, d, j=8Hz 2Ch), 9.53(H, S, NH).

2-(4-Methoxyphenyl)-4, 5-diphenyl-1H-imidazole (A3)

Pala yellow crystals, Yield: 0.28 g (86%) mp: 227-230°C. IR (λ_{\max} [cm⁻¹] (KBr): 3442(NH Str.); 3070(CHARom Str.); 1599(C=C Str.); 1450(C=N Str.). ¹H NMR(400.13 MHZ CDCl₃) δ (ppm): 3.84(3H,s,CH₃);6.93(2H,d,j=8Hz, 2CH); 7.27-7.53 (10H,m, 10CH), 7.82(2H,d,³J=8Hz, 2CH).

2-(3-Nitrophenyl)-4, 5-diphenyl-1H-imidazole (A4)

Pale yellow crystals, Yield: 0.3 g (88%) mp>300°C. IR (λ_{\max} [cm⁻¹] (KBr): 3400(NH); 3055 (CHARom); 1600(C=C); 1475(C=N); 1420, 1375 (NO₂).

Therefore, reported SiO₂-NaHSO₄ as catalyst which could provide an efficient, cheap, easy separation high yield and simple route under solvent-free condition for the synthesis of imidazoles.

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