



Mesoporous SiO₂-Al₂O₃: An Efficient Catalyst for Synthesis of 4,5-dihydro-1,3,5-triphenyl-1H-pyrazole

Deepak Tayde ^a *, Machhindra Lande^b

^aDepartment of Chemistry, M.J.M. ACS College, Karanjali, (Peth), Nashik-422208, India

^bDepartment of Chemistry, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad-431004, India

ARTICLE INFO

ABSTRACT

Article history:

Received 23 February 2021

Received in revised form 8 March 2021

Accepted 7 May 2021

Available online 7 May 2021

Keywords:

Pyrazoline

Mesoporous oxides

Hydrothermal method

Condensation

Mesoporous SiO₂-Al₂O₃ nano sized mixed metal oxide (MMO's) used as a catalyst readily synthesized by hydrothermal method in high pressure autoclave. It shows highly efficient, recyclable and mild catalyst for the condensation reaction of substituted chalcone and phenyl hydrazine hydrate to obtain 4,5-dihydro-1,3,5-triphenyl-1H-pyrazole derivatives in excellent yields of product at short reaction times under simple experimental condition. The synthesized material particle size was controlled by CTAB as structure directing agent and calculated by BET Surface area. The structural characteristic of catalyst is identified by XRD, SEM, EDS, TEM analysis. The acidic strength of catalyst was measured by Ammonia-Temperature Programmed Desorption (NH₃-TPD).

1. Introduction

Mesoporous mixed metal oxides attracted more attention within the area of catalysis as a result of their various properties and applications [1, 2]. The superior properties are to boost the rate of reaction, reusability and environmentally green approach. The O, N, S and P hetero atom containing organic moieties are called as heterocyclic compounds.

The nitrogen containing heterocyclic compounds has a unique role within the progress of heterocyclic chemistry. Pyrazoline are nitrogen containing heterocyclic basic unit of drug molecules extensively used as synthons in various organic synthesis like pyrazoline, isoxazoles and isothiazols [3-10].

There were only a few reports on the synthesis of pyrazoline compounds, which were synthesized by using various sorts of catalysts like ZnO nanoparticles [11], Copper (II) chloride [12], γ -Fe₂O₃@SiO₂-PW₁₂ nanoparticles [13], Nano-SiO₂,H₁₄[NaP₅W₃₀O₁₁₀]/SiO₂ [14] etc.

The modified structures of pyrazoline having considerable interest owing to it possesses a various biological activity, such as antibacterial, antitumor,

anticancer, antitubercular etc. [15].

Pyrazolines also acting as hole transporting material in OLED (organic electroluminescent device) thanks to presence of $p\pi$ conjugated system which is generated by one in all the nitrogen atom [16, 17].

In the literature survey, there are various methods for the synthesis of pyrazoline derivatives such as in 19th century Fischer and Knoevenagel, developed most well-like method for the preparation of 2-pyrazolines [18]. In 1998, Powers et al. [19]

reported that presence of sodium hydroxide as catalyst but there is a drawback due to longer the reaction time (8 h) (A).

Synthesis of 3, 5-diaryl-2-pyrazolines (B) in the presence of acetic acid reported at 2005 by Levai. The economic and environmental related issue suffers in these reactions. Revanasiddappa et al., (2010) reported the synthesis and biological evaluation of some novel pyrazoline derivatives.

Synthesized compounds, antibacterial and antifungal activities were evaluated and most of the compounds were moderately active against the bacteria and fungi [20] (C). Jyothi et al., (2012) also synthesized some novel pyrazolines with antimicrobial activity. This is a two-step process [21] (D).

* Corresponding author. Tel.: +919421983158; e-mail: dtt_chem@yahoo.com