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ORIGINAL ARTICLE

Silver-Decorated Nanocatalyst for Sustainable Development of Tetrahydrobenzo[b]Pyran Derivatives by Heterocyclization

K. S. Patil[1] · H. T. Soundade[1] · P. R. Kharade[2] · K. N. Alasundkar[3] · S. T. Mane[4] · D. G. Kanase[4]

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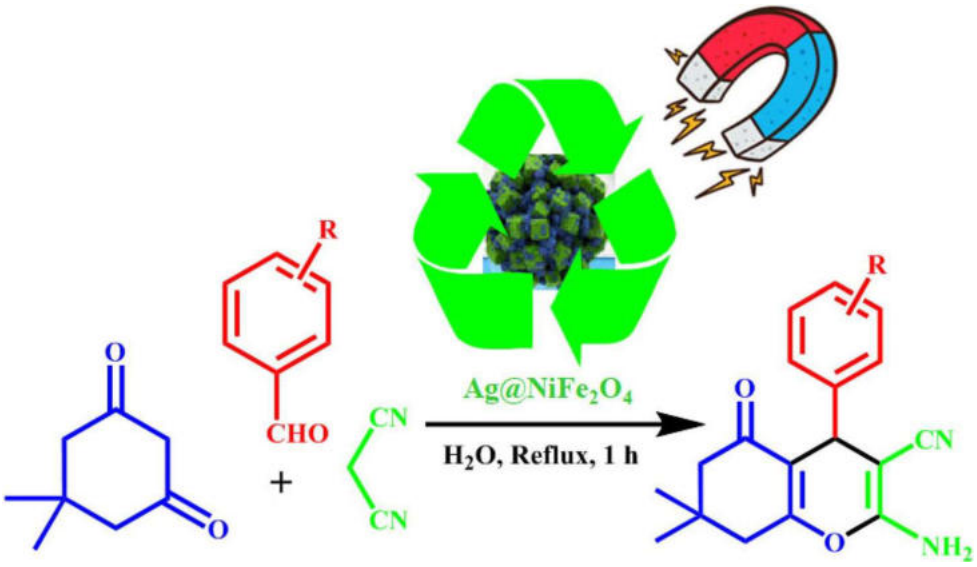
Abstract

A sustainable and efficient methodology was developed for the synthesis of tetrahydrobenzo[b]pyran (THBP) derivatives via a one-pot multicomponent heterocyclization reaction of various aldehydes, malononitrile, and dimedone in an aqueous medium. The reaction was catalyzed by a silver-decorated magnetic nanocatalyst ($Ag@NiFe_2O_4$) under mild conditions, affording the desired products in high yields and short reaction times. The structural, morphological, and magnetic properties of the synthesized nanocatalyst were comprehensively characterized using Fourier transform infrared (FT-IR) spectroscopy, X-ray diffraction (XRD), scanning electron microscopy (SEM), and porous properties analysis. The catalyst exhibited excellent catalytic activity, easy magnetic separation, and remarkable reusability without significant loss of performance over multiple cycles. This sustainable methodology offers cost-effective and practical approach for the synthesis of biologically important THBP derivatives.

Graphical Abstract



Keywords Heterocyclization · Nanocatalyst · Silver-decorated · Tetrahydrobenzo[b]pyrans · Sustainable

Extended author information available on the last page of the article

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