

Synthesis of Functionalized Dihydropyrrol-2-ones in the Presence of CoFe_2O_4 Nanoparticles Under the Eco-Friendly Conditions

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Streszczenie

This study aims to develop an efficient and eco-friendly catalytic system for the synthesis of functionalized dihydropyrrol-2-ones using cobalt ferrite (CoFe_2O_4) magnetic nanoparticles. CoFe_2O_4 nanoparticles were synthesized via a simple one-pot co-precipitation method, yielding spherical particles with an average size of 3–9 nm. The catalytic performance was evaluated in a one-pot, four-component domino reaction involving amines, dimethyl acetylenedicarboxylate (DMAD), and formaldehyde, producing dihydropyrrol-2-one derivatives in excellent yields (87%–94%). The catalyst demonstrated remarkable stability and reusability, maintaining high efficiency over five consecutive cycles. Structural characterization of the products was confirmed by FT-IR, ^1H NMR, ^{13}C NMR, and single-crystal x-ray diffraction. This work highlights a practical and sustainable approach for the synthesis of biologically relevant heterocycles, emphasizing the advantages of using magnetic nanocatalysts under green conditions, which could have significant implications for industrial applications. Also, after the reaction, the catalyst can be reused five times with only a minimal reduction in effectiveness.

Słowa kluczowe

Cobalt ferrite, Dihydropyrrol-2-ones, Magnetic nanocatalyst, X-ray single crystal

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