SO_3H-Functionalized Epoxy-Immobilized Fe_3O_4 Core–Shell Magnetic Nanoparticles as an Efficient, Reusable, and Eco-Friendly Catalyst for the Sustainable and Green Synthesis of Pyran and Pyrrolidinone Derivatives

Autorzy

Fatemeh Kalantari

Hussein Esmailipour

Hamideh Ahankar

Ali Ramazani

Hamideh Aghahosseini

Oskar Kaszubowski

Katarzyna Ślepokura

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Streszczenie

A SO_3H-functionalized epoxy-immobilized Fe_3O_4 core–shell magnetic nanocatalyst was prepared through a simple three-step procedure, and it was identified by various analyses such as Fourier transform infrared (FT-IR) spectroscopy, scanning electron microscopy (SEM), differential thermal gravity (DTG), Brunauer–Emmett–Teller (BET) analysis, transmission electron microscopy (TEM), energy-dispersive X-ray spectroscopy (EDX), thermogravimetric analysis (TGA), vibration sample magnetometry (VSM), and powder X-ray diffraction (PXRD). BET analysis showed that the as-prepared nanocatalyst was synthesized with a mesoporous structure and high specific area (35.45 m^2 g^{-1}). The TEM image clearly showed that the particle size distribution was in the range of 47–65 nm. The designed magnetic nanocatalyst was used successfully in the synthesis of pyran derivatives via the reaction of dimedone, malononitrile, and various aromatic aldehydes and synthesis of pyrrolidinone derivatives via the reaction of various aromatic aldehydes, aniline, and diethyl acetylenedicarboxylate. The nanocatalyst was simply isolated from the reaction mixture utilizing an external magnet and reused several times according to the model reactions without significant loss in its efficiency.

Słowa kluczowe

Aromatic compounds, Catalysts, Ethanol, Reaction products, Solvents

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https://www.acs.org/content/acs/en.html