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July 19, 2023, 5:13PM

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Nickel-Palladium nanoparticles supported on multi-walled carbon nanotubes as an effective catalyst for Sonogashira cross-coupling reactions

By: Coker, Katherine; Picinich, Lacey; **Siamaki, Ali R.**

Sonogashira cross coupling reactions have a wide range of applications in pharmaceutical industry for drug discovery and organic synthesis of natural products and pharmaceutical compounds. These reactions typically involve the coupling of aryl halides with terminal alkynes in the presence of palladium catalyst under appropriate reaction conditions. Most Sonogashira reactions have been carried out with homogeneous Pd catalysis, in which the catalyst is soluble in the reaction mixture. There are many disadvantages to this method including the difficulty to remove the catalyst from the sample and recyclability. Heterogeneous catalysis is an alternative approach to address the issues associated with homogeneous system mainly due to facile and clean removal of the catalyst and minimal metal residual contamination. Herein, we report the preparation of nickel-palladium nanoparticles supported on multi-walled carbon nanotubes (Ni-Pd/MWCNTs) as an effective heterogeneous catalyst for Sonogashira coupling reactions. The catalyst was prepared by mixing the appropriate ratio of nickel-palladium salts with multi-walled carbon nanotubes using a mechanical power of a ball mill. The nanoparticles prepared by this method were successfully used to catalyze Sonogashira coupling reactions of various substituted aryl halides and terminal alkynes using an equal amount of water and ethanol as an environmentally benign solvent system. This project provides a facile and effective method for large-scale preparation of Ni-Pd/MWCNTs to catalyze Sonogashira cross-coupling reactions. The recyclability of the catalyst makes this an affordable and clean option for pharmaceutical and industrial applications.

Conference

Source

Abstracts, Northeast Regional Meeting of the American Chemical Society, Rochester, NY, United States, October 2-5
Pages: NERM-435
Conference; Meeting Abstract
2022
CODEN: 70APMA
[View all Sources in SciFinder[®]](#)

Database Information

AN: 2023:500587

CAplus

Company/Organization

Chemistry, Physics and Materials Science
Fayetteville State University
Fayetteville, North Carolina
United States

Publisher

American Chemical Society

Language

English