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研究论文

Catalytic Performance of Nano-SiO_2-Supported Preyssler Heteropolyacid in Esterification of Salicylic Acid with Aliphatic and Benzylic Alcohols

Fatemeh F. BAMOHARRAM1,*, Majid M. HERAVI2, Javad EBRAHIMI1, Ali AHMADPOUR3, Mojtaba ZEBARJAD4

1Department of Chemistry, Islamic Azad University, Mashhad Branch, Mashhad, Iran; 2Department of Chemistry, School of Sciences, Alzahra University, Tehran, Iran; 3Deptartment of Chemical Engineering, Faculty of Engineering, Ferdowsi University of Mashhad, Mashhad, Iran; 4Department of Materials Science and Engineering, Faculty of Engineering, Ferdowsi University of Mashhad, Mashhad, Iran

Fatemeh F. BAMOHARRAM1,*, Majid M. HERAVI2, Javad EBRAHIMI1, Ali AHMADPOUR3, Mojtaba ZEBARJAD4

1Department of Chemistry, Islamic Azad University, Mashhad Branch, Mashhad, Iran; 2Department of Chemistry, School of Sciences, Alzahra University, Tehran, Iran; 3Deptartment of Chemical Engineering, Faculty of Engineering, Ferdowsi University of Mashhad, Mashhad, Iran; 4Department of Materials Science and Engineering, Faculty of Engineering, Ferdowsi University of Mashhad, Mashhad, Iran

摘要 An efficient and environmentally benign procedure for the catalytic esterification of salicylic acid with aliphatic alcohols, $C_nH_{2n+1}OH$ (n = 1–5) and benzylic alcohols, $RC_6H_4CH_2OH$ (R = H, NO_2, OCH_3, Br, Cl, Me) was developed using nano-SiO_2-supported Preyssler heteropolyacid both under thermal conditions and microwave irradiation. Silica nanostructures were obtained through a sol-gel method and were characterized by transmission electron microscopy and powder X-ray diffraction. The effects of various parameters such as solvent type, molar ratio of substrates, Preyssler heteropolyacid loading on silica, catalyst amount, temperature, and reaction time were studied and the optimum conditions were obtained. It has been found that the catalyst with 30 wt% loading is highly active and shows high yields in esterification reactions. The use of nano-SiO_2-supported Preyssler heteropolyacid coupled with microwave irradiation allows a solvent-free, rapid (3 min), and high-yielding reaction. This catalyst can be easily recovered and reused for many times without a significant loss in its activity.

关键词： Preyssler heteropolyacid silica esterification salicylic acid

Abstract： An efficient and environmentally benign procedure for the catalytic esterification of salicylic acid with aliphatic alcohols, $C_nH_{2n+1}OH$ (n = 1–5) and benzylic alcohols, $RC_6H_4CH_2OH$ (R = H, NO_2, OCH_3, Br, Cl, Me) was developed using nano-SiO_2-supported Preyssler heteropolyacid both under thermal conditions and microwave irradiation. Silica nanostructures were obtained through a sol-gel method and were characterized by transmission electron microscopy and powder X-ray diffraction. The effects of various parameters such as solvent type, molar ratio of substrates, Preyssler heteropolyacid loading on silica, catalyst amount, temperature, and reaction time were studied and the optimum conditions were obtained. It has been found that the catalyst with 30 wt% loading is highly active and shows high yields in esterification reactions. The use of nano-SiO_2-supported Preyssler heteropolyacid coupled with microwave irradiation allows a solvent-free, rapid (3 min), and high-yielding reaction. This catalyst can be easily recovered and reused for many times without a significant loss in its activity.

Keywords： Preyssler, heteropolyacid, silica, esterification, salicylic acid

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