Catalysis Letters
https://doi.org/10.1007/s10562-020-03388-5

Molybdenum Carbonyl Grafted on Amine-Functionalized MCM-22 as Potential Catalyst for *Iso*-Eugenol Oxidation

Preeti Sahu[1] · Alex Tincy[1] · Awadakkam Sreenavya[1] · Ganapati Shanbhag[2] · Ayyamperumal Sakthivel[1]

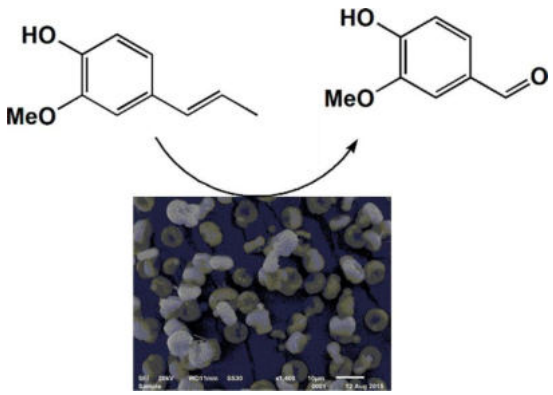
Received: 19 June 2020 / Accepted: 4 September 2020

Abstract

Different concentrations of molybdenum carbonyl were incorporated on the surface of amine-functionalized MCM-22. The obtained samples were thoroughly characterized by Fourier-transform infrared spectroscopy (FTIR), powder X-Ray diffraction (XRD), high-resolution transition electron microscopy (HRTEM), N_2-sorption and thermo-gravimetric analysis (TGA) methods. HRTEM images confirmed the uniform distribution of active molybdenum species on the functionalized MCM-22. The resultant materials were explored for liquid-phase oxidation of *iso*-eugenol at ambient reaction conditions. The catalyst with 6 wt% $Mo(CO)_6$ loaded materials showed comparable conversion (87%) with vanillin as the major product (selectivity of 61%) for the chosen reaction. The better catalytic activity of MCM-22-DA-Mo catalyst having 6 wt% loading of Mo carbonyl could be due to the uniform distribution of molybdenum species on MCM-22-DA surface. Importantly, the catalyst retained its activity even after several runs.

Graphic Abstract

Molybdenum carbonyl were incorporated on the surface of amine-functionalized MCM-22 by the post-synthesis method. The resultant MCM-22-DA-Mo showed promising activity on iso-eugenol oxidation with a conversion of 87%.



Keywords Zeolites · MCM-22 · Aminosilane grafting · Molybdenum carbonyl · *Iso*-eugenol oxidation · Vanillin

Preeti Sahu and Alex Tincy have equally contributed.

✉ Ayyamperumal Sakthivel
sakthivelcuk@cukerala.ac.in; sakthiveldu@gmail.com

[1] Inorganic Materials & Heterogeneous Catalysis Laboratory, Department of Chemistry, School of Physical Sciences, Central University of Kerala, Kasaragod, Kerala 671320, India

[2] Materials Science & Catalysis Division, Poornaprajna Institute of Scientific Research (PPISR), Bidalur Post, Devanahalli, Bengaluru 562164, India

1 Introduction

The historical significance of catalysis in the industrial processes has been known over the decades [1]. Heterogeneous catalysts play a pivotal role in fine chemicals, cosmetics, biochemical, and petroleum industries [2]. In particular, heterogeneous catalysts based on inorganic oxide, such as silica, alumina, hydrotalcite, clay, zeolites and zeolite-like microporous materials, polymers, and other mesoporous

Published online: 15 September 2020