T. LI, F. CHEN, R. LANG, H. WANG, Y. SU, B. QIAO*, A. WANG, T. ZHANG* (DALIAN INSTITUTE OF CHEMICAL PHYSICS, P. R. OF CHINA)

Styrene Hydroformylation with In Situ Hydrogen: Regioselectivity Control by Coupling with the Low-Temperature Water-Gas Shift Reaction

Angew. Chem. Int. Ed. 2020, 59, 7430–7434.

Hydroformylation of Styrene Derivatives Catalyzed by Rhodium Single-Atoms Supported on CeO₂

Results:

conversion: 55% yield
selectivity for aldehyde: 75% yield
l/b = 3.0

conversion: 94% yield
selectivity for aldehyde: 61% yield
l/b = 2.7

conversion: 49% yield
selectivity for aldehyde: 72% yield
l/b = 3.0

conversion: 47% yield
selectivity for aldehyde: 80% yield
l/b = 12

conversion: 99% yield
selectivity for aldehyde: 77% yield
l/b = 4.0

conversion: 97% yield
selectivity for alcohol: 99% yield

(3)

Significance: A rhodium single-atom catalyst on CeO₂ (Rh₁/CeO₂) was prepared by mixing RhCl₃ and CeO₂ in deionized water, followed by calcination at 400 °C (eq. 1). Rh₁/CeO₂ catalyzed the hydroformylation of styrene derivatives with hydrogen generated in situ from water and carbon monoxide to give the corresponding linear aldehydes in ≤ 99% conversion (eq. 2).

Comment: Rh₁/CeO₂ was characterized by means of ICP-OES, STEM, HAADF-STEM, FT-IR, EDS analyses. In the hydroformylation of styrene, Rh nanoparticles supported on CeO₂ (NP-Rh/CeO₂) gave 3-phenylpropan-1-ol rather than 3-phenylpropanal, with 99% selectivity (eq. 3).

SYNFACTS Contributors: Yasuhiro Uozumi, Shintaro Okumura

Synfacts 2020, 16(07), 0825 Published online: 17.06.2020

DOI: 10.1055/s-0040-1707826; Reg-No.: Y05420SF

© 2020, Thieme. All rights reserved.
Georg Thieme Verlag KG, Rüdigerstraße 14, 70469 Stuttgart, Germany

Category

Polymer-Supported Synthesis

Key words

rhodium catalysis

hydroformylation

single-atom catalyst

styrenes

Synfact
of the
Month

This document was downloaded for personal use only. Unauthorized distribution is strictly prohibited.