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Rhodium complexes supported on zinc aluminate spinel as catalysts for hydroformylation and hydrogenation: preparation and activity.

Autorzy

Józef Wrzyszcz

Mirosław Zawadzki

Anna M. Trzeciak

Józef J. Ziółkowski

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Streszczenie

The heterogenization of active homogeneous rhodium catalysts on zinc aluminate spinel has been studied. The $ZnAl_2O_4$ support was prepared by a hydrothermal process and characterized by transmission electron microscope (TEM), RTG, and textural investigations. The rhodium(I) complexes, $Rh(acac)(CO)_2$, $Rh(acac)(CO)(PPh_3)$, and $RhCl(CO)(PPh_3)_2$, supported on the spinel, gave $Rh(CO)_2^+$, $Rh(CO)(PPh_3)^+$, and $Rh(CO)(PPh_3)_2^+$ species, respectively, as confirmed by IR spectra. $Rh(CO)_2^+$ on the spinel with an excess of PPh_3 effectively catalysed the hydroformylation of 1-hexene under 1 MPa of H_2/CO at 356 K. Aldehydes yield of 40–95% were obtained with an *n*/*iso* ratio of ca. 3. The coordination of 1-hexene to supported $Rh(CO)_2^+$ species was evidenced by the appearance of a ν(CO) band at 2053 cm^{-1}. $Rh(CO)_2^+$-supported on the spinel catalysed the hydrogenation of nitrobenzene and chloronitrobenzene at 1 MPa of H_2 and 356 K with a TON of 400–500 h^{-1}.The $ZnAl_2O_4$ support was prepared by a hydrothermal process and characterized by TEM, RTG, and textural investigations. The heterogenization of rhodium(I) complexes $Rh(acac)(CO)_2$, $Rh(acac)(CO)(PPh_3)$, and $RhCl(CO)(PPh_3)_2$, gave $Rh(CO)_2^+$, $Rh(CO)(PPh_3)^+$, and $Rh(CO)(PPh_3)_2^+$ species, respectively, as confirmed by IR spectra. $Rh(CO)_2^+$ on the spinel with an excess of PPh_3 effectively catalysed the hydroformylation of 1-hexene under 1 MPa of H_2/CO at 356 K. Aldehydes yield of 40–95% were obtained with an *n*/*iso* ratio of ca. 3. The coordination of 1-hexene to supported $Rh(CO)_2^+$ species was evidenced by the appearance of a (CO) band at 2053 cm^{-1}. $Rh(CO)_2^+$ supported on the spinel catalysed the hydrogenation of nitrobenzene and chloronitrobenzene at 1 MPa of H_2 and 356 K with a TON of 400–500 h^{-1}.

Słowa kluczowe

Zinc aluminate spinel, Hydrothermal process, Supported rhodium complexes, Hydroformylation, Hydrogenation

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