

N°963 /

TOPIC(s) : Homogenous, heterogenous and biocatalysis / Waste valorization

Metal nanoparticles for selective catalysis

AUTHORS

Carmen CLAVER / UNIVERSITY ROVIRA I VIRGILI-CTQC, CAMPUS SESCELADES URV, TARRAGONA

PURPOSE OF THE ABSTRACT

Metal nanoparticles (NPs) combine advantages of both homogeneous and heterogeneous catalysts, namely high activity/selectivity and facility for recycling and reuse. To enhance their catalytic performance, it is necessary to induce control on the physical and chemical properties. From previous results, we know that strongly coordinating ligands induce efficiently this control. In the case of colloidal NPs, however, loss of activity can be produced due to an agglomeration of the particles and the recycling is difficult. The use of supported catalysis is therefore required to ensure the sustainability of the catalytic processes. To develop supported NPs efficient in catalysis is one of the objectives in our group. [1]

Here, a new and facile procedure to synthesize metal NPs stabilized by strongly coordinating N-heterocyclic carbene (NHC) ligands will be presented. To date, similar NHC-stabilized NPs were prepared by complicated multi-step synthesis and required the use of strong bases. [2] Our approach consists of a "one pot" procedure involving in-situ generation of free NHC-ligands through decarboxylation of 1,2-dimethylimidazolium-2-carboxylate (Me₂Im-CO₂) under M-NPs preparation reaction conditions. This new methodology has been successfully applied for the preparation of colloidal and immobilized Ni-NPs [3]. Later it has been extended to the immobilization of Pd, Cu and bimetallic PdCu nanoparticles onto multiwall carbon nanotubes (MWCNTs).

The supported Ni, Pd and PdCu nanocatalyst behave as an efficient heterogeneous catalyst in the partial selective hydrogenation of terminal alkynes to afford the corresponding alkenes under mild reaction conditions. The catalysts can be readily recovered by simple filtration and reused without a noticeable loss in its catalytic activity.

FIGURES

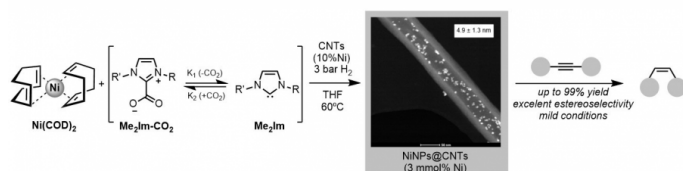


FIGURE 1

Metal nanoparticles for selective catalysis

Figure 1. Immobilized NHC-stabilized metal NPs as catalyst in alkyne hydrogenation

FIGURE 2

KEYWORDS

catalysis | metal | nanoparticles | hydrogenation

BIBLIOGRAPHY

References

- [1]. a) J. Llop, K. C. Szeto, W. Barakat, N. Merle, C. Godard, M. Taoufik, C. Claver, Chem. Commun., 2017, 53, 3261. b) J.A. Delgado, C. Claver, S. Castillon, V. Ordonsky, D. Curulla, C. Godard, Applied Catalysis A:General 2016, 513, 39
- [2] L. M. Martinez-Prieto, A. Ferry, P. Lara, C. Richter, K. Philippot, F. Glorius and B. Chaudret,