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Ru, Pd, Pt as dopants of carbon nanofibers-supported Ni catalysts for one-pot cellobiose conversion

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Introduction

The reduction of sugars to their hydrogenated forms (sorbitol) emerges as an effective chemical route for enhancing the productivity of cellulose depolymerization process [1]. Whereas nickel does not fulfill the activity and selectivity criteria at low metal contents, its doping with noble metals could represent an economical trade-off.

Experimental

A series of carbon nanofibers (CNF) supported Ni-noble metal (Ru, Pt, Pd) catalysts, with intended metal loadings of 3.0 and 0.5 wt.%, respectively, was prepared by wet co-impregnation of the precursor salts, followed by thermal decomposition and H_2-reduction. The samples were characterized by different techniques (ICP-OES, XRD, TPR and HRTEM) and tested in the hydrolytic hydrogenation of cellobiose (180ºC, 4.0 MPa of H_2, 3h).

Results and discussion

The Ni-noble metal alloy formation induced changes on the size and dispersion of the Ni phase and favored its reductive properties, which was translated into an enhancement on the catalytic performance. A remarkable synergic effect was noticed for Ni-Pt/CNF and Ni-Pd/CNF, since the yield of hydrogenated products (96.0 and 61.2 %, respectively) exceeded the sum of the activity of their pure constituents separately (32.9, 0.44 and 25.9 % for Ni/CNF, Pd/CNF and Pt/CNF) (Figure 1). In turn, Ru/CNF enabled the practically total hydrogenation of cellobiose, making unnecessary the Ni-Ru alloy formation.

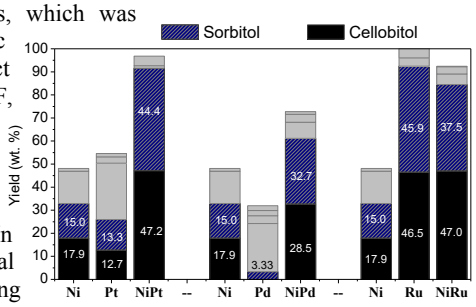

Figure 1. *Summarized catalytic results*

Conclusions

The Ni selectivity towards targeted compounds was enhanced upon alloying it with Pt, Pd and Ru. TPR-H_2 results and the analysis of the morphology of the metal particles helped to understand the origin of this improved catalytic behavior.

Acknowledgements

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References

[1] A. Cabiac, E. Guillon, F. Chambon, C. Pinel, F. Rataboul, N. Esayem Cellulose reactivity and glycosidic bond cleavage in aqueous phase by catalytic and non catalytic transformations Applied Catalysis A: General 402 (2011) 1-10.

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