

Progress On The Role Of Bismuth As A Selectivity Modifier In AuPd Catalysts

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ABSTRACT

The use of promoters/modifiers is of topical interest in the field of heterogeneous catalysis and gaining insight on the origin of such effects allows to optimize catalyst design and, by implication, the catalytic performances. [1-2]

This study aimed to unravel the role of bismuth as modifier of bimetallic well-defined Au-Pd nanoparticles supported on carbon, when used as catalysts for oxidation and hydrogenation reactions.

Cinnamyl alcohol and cinnamaldehyde were selected as model substrates offering the possibility to study the preferential oxidation of the C-OH, C=O, and preferential reduction of C=C, C=O functional groups, respectively. Actually, the presence of small amount of bismuth slightly depressed the catalytic activity but at the same time shifted the selectivity of AuPd nanoalloys in both hydrogenation and oxidation reactions, in agreement with previous reports.[3]

The use of a combination of several characterization techniques (transmission electron microscopy, X-rays absorption spectroscopy) helped in determining some structure-activity relationships of trimetallic Au-Pd-Bi catalysts with respect to analogue Au-Pd catalysts. According to the experimental evidence, the modification of activity and selectivity observed for trimetallic AuPdBi catalysts could be ascribed to the presence of highly dispersed bismuth oxide phase in intimate contact with Au and Pd sites. In this view the action of bismuth might be explained in terms of blocking of the most active AuPd sites, resulting in a decrease of activity with simultaneous selectivity enhancement due to the minimization of side reactions.

However, a full understanding of the correlation between the structure of Bi-modified catalysts and the effects on the chemical reactions at their surfaces remains a major challenge. For these reasons further investigation is still required and in this view a perspective regarding more advanced ex situ and in situ technique will be offered.

REFERENCES

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