Supported nanocatalysts and their testing in organic synthesis

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In the context of the current oil crisis, biomass derived products and fuels have become increasingly present in our world. One of them, n-Bio-butanol is a bio product/biofuel that can be obtained from the alcoholic fermentation of biomass derivatives[1,2] but also from the anaerobic fermentation of glycerol (Green Biologics)[3]. Besides its use as fuel or additive for gasoline or diesel[4], n-bio-butanol has several uses as: solvent (as such or as an ester), plasticizers, extraction agent (for the production of antibiotics, hormones, vitamins, and alkaloids), additive for de-icing fluids or chemical intermediate (esters, aldols, ethers, alkanes, etc.)[5].

In addition, one of the important ways to capitalize on the n-butanol is to transform it in butyraldehyde. This has a potential of key intermediate when used to obtain synthetic resins, plasticizers, pesticides, plant protection products, rubber accelerators, textiles auxiliaries, odorants/flavorings, pharmaceutical products or additives for fuels[6, 7].

In order to take advantage of the aforementioned strong points we have prepared nano type Cu catalysts and impregnated type Cu catalysts[8] on Al_2O_3, TiO_2 and SiO_2 support. The catalysts are obtained in the presence/absence of ultrasounds. Their catalytic activity has been tested within the gas phase dehydrogenation reaction of n-butanol to butyraldehyde. This system has been chosen due to the lower vaporization/condensation points, to the accessible reaction temperatures in the lab, and to the reduced number of byproducts. We have worked at temperatures of 300 °C, 325 °C, 350 °C, G_{H2} – 10 ml/min[12], $G_{butanol}$ – 0.133 ml/min, introduced through a gas-liquid mixer. The reactant and the reaction products have been determined through a GC-FID method which provides information about the conversion of butanol and the selectivity in butyraldehyde and di-butyl-ether. The best conversion and selectivity in butyraldehyde have been obtained in the case of Al_2O_3 and SiO_2 supported catalysts, when the precursor was copper acetate, but in the case of Cu/SiO_2, the selectivities in di-butyl-ether and other products were the lowest. In the future we aim at improving the catalyst activity by applying US and MW to the catalysts obtaining process.

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