The role of Catalysis in the Roadmap to Bioeconomy: the case of Oleochemicals

Nicoletta Ravasio
CNR ISTM, via C.Golgi 19, 20133 Milano
n.ravasio@istm.cnr.it

Many catalytic steps are involved in the long way from cellulosic biomass to chemicals or fuels. Hydrogenation and acid catalyzed ones are more often used, either separated or combined in bifunctional processes [1, 2].

This holds also in the field of oleochemicals production.
Hydrogenation of vegetable oils to margarines or to fatty acid alcohols has been carried out on a industrial scale since the beginning of the 20^{th} century. However, to develop new processes and new products starting from renewable raw materials new challenges have to be taken on. One of these is to make available feedstock with standard composition independently from the natural source or other features. To face this issue we set up a very selective process for the hydrogenation of polyunsaturated oils to monounsaturated ones with limited *cis*/*trans* and positional isomerisation. This process, relying on the use of a supported Cu catalysts, allows one to produce very high oleic oils suitable as feedstock for esterification, epoxidation, metathesis and oxidative cleavage reactions[3-5]. Therefore it provides the opportunity to plan a versatile protocol for the production of oleochemicals, useful to face not only price variations but also different supplying needs, depending on regional, climatic and seasonal availability, making a wide portfolio of raw materials available without interfering with the food market.

We also set up protocols for the esterification of fatty acids to produce biodiesel, lubricants, hydraulic fluid and monoglycerides [6-8]. These processes rely on the use of SiO_2-Al_2O_3, SiO_2-ZrO_2 or SiO_2- TiO_2 amorphous mixed oxides, that often perform better than zeolites and other solid acids as far as both activity and reusability are concerned.

The robustness of these solids under esterification reaction conditions make them suitable also for the esterification /transesterification of secondary raw materials such as fatty acids from vegetable oil refining, soapstocks and rendering fats.

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