Selective Conversions of Oleochemicals via Heterogeneous Catalysis

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Vegetable oils are used for various applications, both in food and industrial products. Although different vegetable oils with various chemical compositions are available in nature, catalytic modification is necessary to enlarge their usage possibilities and to anticipate on the fluctuating oil production numbers and oil prices. With the use of a selective catalyst and the appropriate process conditions, the chemical and physical properties of vegetable oils can be tuned to ensure a constant supply of a large range of different oil and fat products for various uses.

This contribution concentrates on two important catalytic advances realized in our centre. A first part focuses on the partial hydrogenation of vegetable oils. This process is used in industry to stabilize the oil against autoxidation and/or to obtain fat products with a certain melting profile. Importantly, the competitive isomerization leading to *trans* fatty acids needs to be eliminated as much as possible as they are considered a risk factor in coronary heart diseases. Unfortunately, literature learns that low *cis/trans* isomerization is almost always associated with a lower hydrogenation selectivity. A new catalytic concept with shape-selective Pt/ZSM-5 catalysts, that is able to decouple the isomerization/hydrogenation selectivity, will be presented.[1] Chemical and physical analysis of the new fat products against commercial benchmarks will be given to show its ideal physical properties despite its essentially *trans*-free composition.[2]

A second part discusses the catalytic conjugation of linoleic acid and vegetable oils. Such conjugated FAs and oils are interesting components for both the chemical as the food/feed industry.[3] A new catalyst, based on modified zeolite USY and Ru, will be presented. This catalytic system is able to conjugate double bonds with high rate without the requirement of hydrogen. Moreover, high selectivities towards the beneficial CLA isomers are obtained.[4]

[1] a) A. Philippaerts, S. Paulussen, S. Turner, O.I. Lebedev, G. Van Tendeloo, H. Poelman, M. Bulut, F. De Clippel, P. Smeets, B. Sels, P. Jacobs, *J. Catal.* (2010), 270, 172-184; b) A. Philippaerts, S. Paulussen, A. Breesch, S. Turner, O.I. Lebedev, G. Van Tendeloo, B. Sels, P. Jacbos, *Angew. Chemie Int. Ed.* (2011), 50, 3947-3949. [2] A. Philippaerts, A. Breesch, G. De Cremer, P. Kayaert, J. Hofkens, G. Van den Mooter, P. Jacobs, B. Sels, *J. Am. Oil Chem. Soc.* (2011), 12, 2023-2034. [3] A. Philippaerts, S. Goossens, P. Jacobs, B. Sels, *ChemSusChem* (2011), 4, 684-702. [4] A. Philippaerts, S. Goossens, W. Vermandel, M. Tromp, S. Turner, J. Geboers, G. Van Tendeloo, P. Jacobs, B. Sels, *ChemSusChem* (2011), 4, 757-767.