

Lipases

The global market for industrial enzymes increases each year. The value of the worldwide use of industrial enzymes is estimated to have grown from \$1 billion in 1995 to 1.5\$ billion in 2000. In 2004, it was estimated at \$1.7 billions and was shared by a few main producers. The detergent industry contributes to more than 30% of the total enzyme market (37%). Textile (12%), starch (11%) baking (8%) and animal feed (8%) are the other main industries. Together, they use about 75% of industrially produced enzymes. The world market of enzymes is expected to reach \$2.4 billions in 2009. Hydrolytic enzymes are by far the most widely used in industry and proteases are the dominant enzyme type because of their extensive use in detergent and dairy industries.

Among hydrolases, lipolytic enzymes (lipases) are used in various fields, the main one being the detergent industry. However, they are also widely employed in the aroma sector, the pharmaceutical industry to produce targeted bioactive molecules,.

In the mid eighties, when (phospho)lipase-catalyzed processes were envisaged as an alternative to chemical catalysis for modifying and improve oils and fats, many drawbacks had to be overcome such as biocatalysts costs or problems of enzymes stability and performances. However, a

huge amount of work has been carried out and now enzymatic transformation of oils and fats is an industrial reality. Indeed, lipases or phospholipases have been proved to be a strong alternative to chemical catalysts for the production of new products with improved nutritional properties. As examples, one can cite the enzymatic degumming of vegetable oils to remove undesirable phospholipids compounds during the refining process or the development of enzymatic interesterification allowing the production of "zero trans" margarines. Moreover, enzymatic processes are much safer to the environment in comparison with chemical ones by limiting the use of organic solvents and by allowing to proceed at moderate temperatures and pressure.

In this lipase dossier, around the Chevreul Conference given by Frédéric Carrière on the tremendous work that was done in Marseille regarding the understanding of *in vivo* lipolysis mechanism, some key European authors in the field of lipase technology, provide examples on the strategies to improve lipases performances by protein engineering methods, on the use of these biocatalysts to produce designer lipids and finally one the use of lipases to modify fatty acids chemical structure via epoxidation reactions.

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