

# Process Innovations for Biocatalytic Esterifications

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Even though the enzymatic production of bulk chemicals, such as of cosmetic ingredients, has already been established on multi ton scale<sup>[1]</sup>, there are still technical limitations existing that need to be overcome. For example fixed bed reactor systems are limited to low viscous reaction mixtures whereas classical stirred tank reactors destroy enzyme immobilisates and therefore do not allow sufficient reuse of expensive catalysts. Furthermore, when processing surfactant-like mixtures desorption of enzymes occurs when using enzyme preparations based on non-covalently bound proteins.

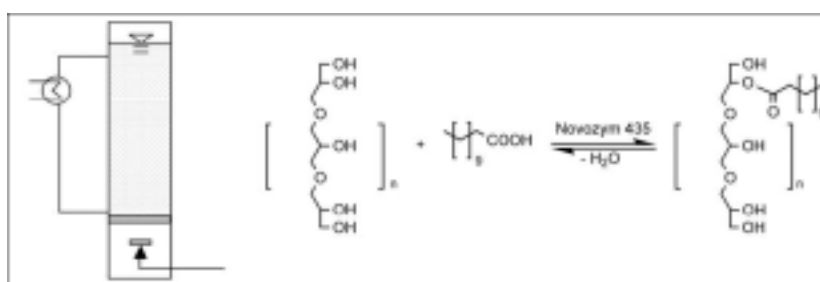


Figure 1. The new reactor concept and a model reaction, the synthesis of highly viscous polyglycerol-3 laurate.

To overcome these limitations we have developed a universal reactor concept for enzymatic esterifications<sup>[2]</sup> that allows the use of raw materials of low and high viscosity. As model reaction served the synthesis of fatty acid esters of simple fatty alcohols as well as of high viscous polyglycerols. Furthermore the new reactor concept allows easy product separation and catalyst recovery, minimizes mechanical stress to the biocatalysts and reduces reaction times compared to known production methods.

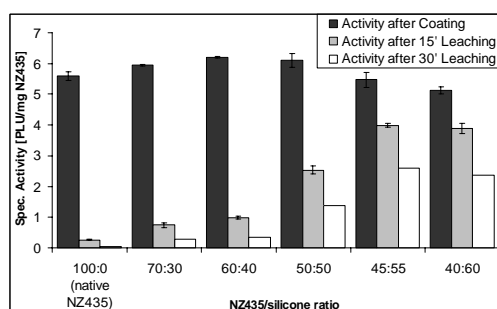


Figure 2. Activity and desorption stability of native and silicone coated NZ435 with different NZ435/silicone ratios.

To enhance the leaching stability of immobilized enzymes and to further optimize their mechanical stability we have developed coating technology based on silicon chemistry that on the one hands yield outstanding activity yields, i. e. almost complete recovery of the enzyme activity, and on the other hand significantly improved stability towards desorption and mechanical stress.

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- [3] L. O. Wiemann, P. Weißhaupt, R. Nieguth, O. Thum, M. B. Ansorge-Schumacher, *Org. Proc. Res. Dev.* **2009**, *in press*. Available online: DOI: 10.1021/op9000059.