Application Note

# Screening of Immobilized Enzymes

## Fast and Convenient Reaction Optimization

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**Enhance R&D productivity in biocatalysis reaction optimization by operating a rotating bed reactor in an advanced synthesis workstation**

Immobilized enzymes are powerful catalysts that can provide an economically attractive and environmentally friendly path to industrial synthesis of organic compounds via for example, hydrolysis, oxidation, reduction and transesterification reactions. The rotating bed reactor (RBR) technology provides a convenient and scalable way of handling heterogeneous reagents such as immobilized enzymes in batch processes from laboratory to production.

**Figure 1.** EasyMax™ 102 Advanced glass vessel with SpinChem® RBR S2 and prepacked cartridges with immobilized lipases.

The SpinChem® RBR design improves catalyst stability and eliminates filtration steps by keeping the immobilized enzyme beads contained in a packed bed. Reactions rates are improved by high flow rates and multiple passages through the bed creating efficient mass transfer to the catalytic sites. Combined with a robust synthesis workstation, heterogeneous reaction optimization can be streamlined to boost R&D productivity. This application note demonstrates screening of six different immobilized lipases for the esterification of lauric acid into propyl laurate using a SpinChem® RBR S2 with prepacked cartridges in an EasyMax™ 102 Advanced synthesis workstation.

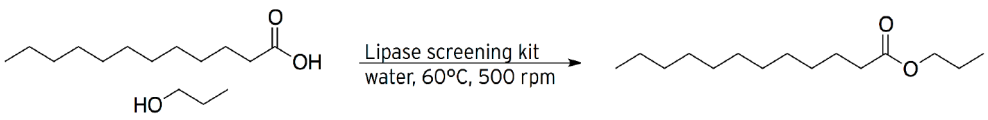


**Figure 2.** A SpinChem® RBR S2 fitted with cartridges (4×2 mL) containing one enzyme at a time from Purolite® Lifetech™ lipase kit, was rotated at 500 rpm in a preheated (60 °C) substrate solution containing lauric acid (84.1 g), 1-propanol (31.5 mL) and water (3.36 mL). Analysis of propyl laurate product was accomplished by GC-FID after 1:50 dilution in heptane containing internal standard (tetradecane). Reactions were repeated twice.

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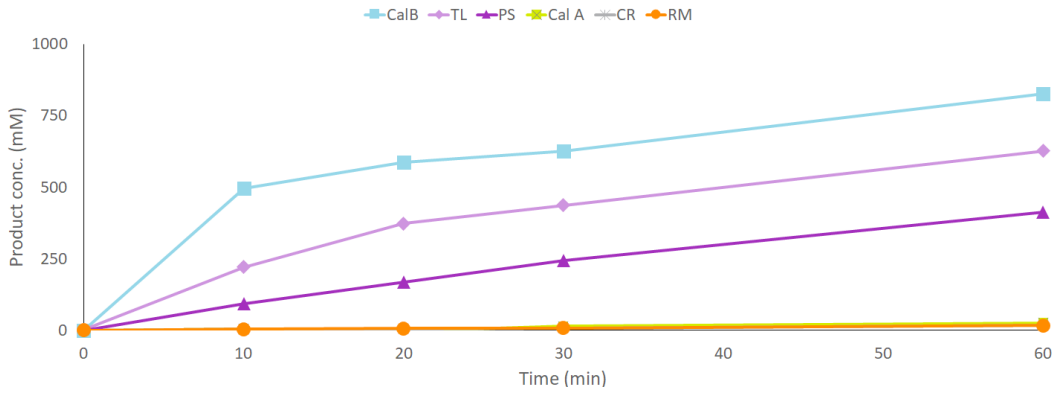


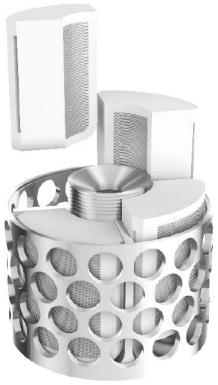

**Figure 3.** Formation of propyl laurate over time for esterification reactions catalysed by different immobilized lipases.

## Results

The esterification reaction was monitored by withdrawing samples with a pipette and required no filtration before analysis. Three of the tested immobilized lipases successfully catalysed the reaction while the others did not. Recombinant Lipase B from Candida antarctica (CalB) immobilized by adsorption on a DVB/methacrylate polymer bead (Purolite® Lifetech™ ECR1030M) proved to be the most efficient enzyme resin, of the six resins tested, for this particular reaction.

## Conclusions

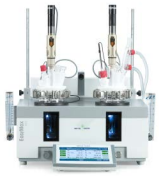
Screening of lipases for the enzyme-catalysed esterification of lauric acid into propyl laurate was successfully achieved by using a SpinChem® RBR S2 fitted to the EasyMax™ 102 Advanced synthesis workstation. The protected confinement of the catalyst beads inside the RBR facilitated analysis since it eliminated any need for filtration during sampling. The stable reaction environment in the workstation and the high flow rates through the RBR allowed for quick and convenient screening of different immobilized lipases to find the enzyme that was most suitable for further reaction optimization.



SpinChem® RBR S2 with prepacked cartridges

**SpinChem® Cartridges**
Kits with prepacked enzyme carrier resins or immobilized enzymes for convenient biocatalysis

**SpinChem® RBR S2**
Efficient rotating bed reactor for 100-500 mL reaction vessels



**EasyMax™ 102 Advanced**
Robust synthesis workstation for high R&D productivity

**Fast and convenient biocatalysis:**

- Easy sampling and product recovery
- No filtration and no bead attrition
- Efficient reaction development

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