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SYNTHETIC SUPPORTS FOR LIPASE IMMOBILIZATION AND EXPLOITATION IN BIODIESEL PRODUCTION AND OIL ESTERIFICATION

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A major factor preventing the use of biodiesel as a key fuel is the cost of the feedstock [1], which can be reduced by exploiting used cooking oil (UCO) as a feedstock, particularly by enzymatic conversion using immobilized lipases to maintain low costs and high efficiency by recycling the biocatalyst. [2] These immobilised lipases can also be exploited to perform reactions in industries as varied as pharmaceuticals, food and cosmetics. [3,4,5]. A range of lipases and carriers were tested for suitability in the conversion of UCO and alcohols to alkyl esters, focusing on lipases from Candida antarctica, Rhizomucor miehei and Thermomyces lanuginosa. The carriers selected were ECR1061M (styrene/methacrylic), ECR8804M, ECR8806M (octadecyl methacrylic), ECR1090M (styrenic) and ECR1030M (divinylbenzene/methacrylic). Lipase TL immobilized on ECR1090M obtained 80 % conversion of UCO and methanol to methyl esters in <2 hours in both solvent-containing and solvent-free systems. [6, 7]. In another study, the regioselectivity of lipase TL was found to differ between carriers and even between immobilisation methods. In general, the immobilisation of lipase TL on octadecyl-functionalised carriers resulted in non-regioselective activity in the formation of ethyl oleate from triolein and ethanol. When immobilized on Purolite ECR8806F, however, lipase TL showed excellent 1,3-regioselectivity and activity up to ten-fold greater than commercial preparations. On the same support but under different immobilisation conditions, this same preparation could hydrolyse all three triolein ester bonds. [8]. Purolite resins packed in Spinchem® RB and MagRBR systems also show great promise in facilitating the rapid screening of conditions for enzymatic synthesis both for biodiesel and other processes. By exploiting rotating bed technology to drive the rotational forces required, the RB and MagRBR can be used on a 5 mL – 100 L scale and simplifies the handling and cleanup of immobilisation and biotransformations significantly.

Biography

After receiving his PhD from the University of York in Chemistry in 2014 studying industrial applications of Baeyer-Villiger monooxygenases, Benjamin Summers has focussed his early career on the use of biotransformations in commercial processes. From 2016 he has worked with Purolite Life Sciences to develop the application of immobilised enzymes and chromatographic resins to a wide range of industrial targets.

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