Enhancing Enzyme Immobilization Efficiency: Insights from NMR Relaxometry and Spectroscopy

Master/Project Thesis in collaboration of the Institute of Technical Biocatalysis and the Institute of Process Imaging

Introduction

Compared to chemical catalysts, enzymes can be a more sustainable alternative due to their low operating temperatures and good selectivity. Immobilisation on carriers makes enzymes particularly interesting for use in continuous industrial processes. Threonine aldolases are of high interest as they can be used to selectively produce pharmaceutical components. However, the conversion can be strongly influenced by diffusion limitation and the effectiveness of prior immobilisation.

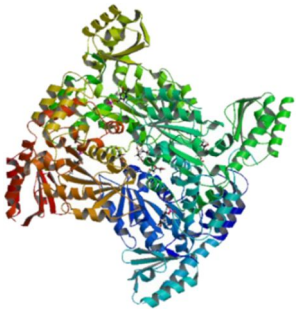

Figure 1: Threonine aldolase structure

Immobilisations can be characterised in a multitude of ways. Conventional methods include adsorption isotherms and scanning electron microscopy imaging techniques. A novel and promising method for characterising immobilisation of enzymes is **n**uclear **m**agnetic **r**esonance (NMR) relaxometry.

Requirements

Commitment, enjoy working in a team
Independent, diligent way of working

Content of the Thesis

This thesis will apply conventional immobilisation characterisation methods in the laboratory and compare the results with those obtained by NMR relaxometry.

Figure 2: Enzyme Carrier

In addition, the diffusion of reaction media in different carriers will be characterised. The diffusion coefficient will be determined by conventional methods. This will then be used to validate the most recent NMR methodology.
It is also possible to use molecular dynamics simulation in this work if interested.

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