BENEFITS OF REACTION ENGINEERING IN BIOCATALYSIS

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Due to its numerous benefits, biocatalysis is considered as a transformational technology for chemical production[1]. This does not surprise considering the mild process conditions and high catalytic power of enzymes. Still, when it comes to its application in industry, not all goes always as well as planned. Industrial biotransformations need to be set up in a way to produce significant amount of product[2] with high product yield, excellent enantioselectivity, volume productivity, substrate conversion etc. Thus, a careful choice of reactor set-up, facilitated by a detailed kinetic analysis, is important.[3] Nowadays, multi-step enzyme catalyzed reactions are of great importance as they facilitate a transformation with lower downstream processing expenses, equilibrium shifting as well as other economic benefits related to the usage of equipment. For an efficient enzymatic process in general, it is important to combine the knowledge of enzyme kinetics, enzyme operational stability, as well as reaction equilibrium. This reveals the dependence of crucial process variables, and enables deep analysis by using the mathematical model and a software (Fig. 1). In this work, the methodology of enzyme reaction engineering applied in our group will be presented. A focus will be put on the problems we found crucial to be investigated in complex enzyme-catalyzed reactions, such as the presence of side-reactions, poor equilibrium position and the enzyme operational stability. Positive outcomes of the application of modeling to overcome these obstacles will be presented.

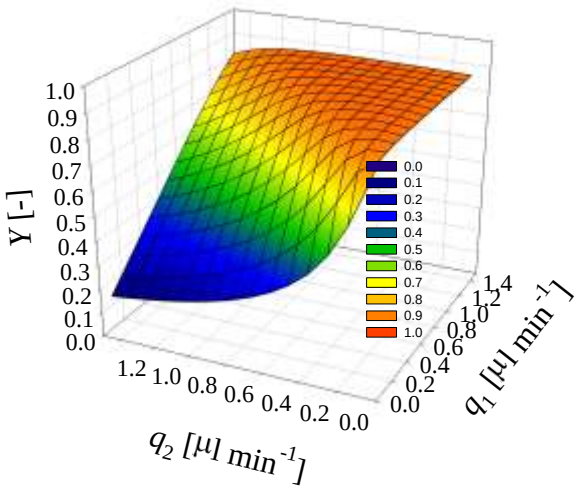

Figure 1 – An example of reaction analysis by using the mathematical model

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