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The problem of non-uniqueness in determining the parameters of enzyme kinetics for biocatalytic reactions

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PURPOSE OF THE ABSTRACT
The problem of non-uniqueness in determining the parameters of enzyme kinetics for biocatalytic reactions

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Process intensification of the development of the biocatalytic process in the microreactor system requires the accurate determination of the parameters of the kinetic model of enzyme-catalyzed biotransformation. In general, the biocatalytic reaction is assumed to obey Michaelis and Menten kinetics. To determine the kinetic parameters, experimental measurements are usually performed in a batch system under conditions where the overall reaction rate is not affected by transport phenomena or biocatalyst concentration. As the complexity of the system and the nature of the biotransformations, e.g., reversible reaction, single or multi substrate reactions, competitive or noncompetitive inhibition, increased, Michaelis and Menten kinetics were further extended to describe multi substrate reactions with complex reaction behavior. And following the kinetic model, e.g., a ping-pong bi-bi mechanism, results in the number of parameters that need to be precisely determined for a given bioprocess.
in this paper we deal with the problem of determining the kinetic parameters of enzyme kinetics with a larger number of parameters. A mathematical proof of the problem of non-uniqueness and, consequently, of the expected problems in determining the unique values of the parameters for the selected enzyme-catalysed reverse reaction of biotransformation is given.

FIGURES

FIGURE 1

FIGURE 2

KEYWORDS
enzyme kinetic parameters | biocatalytic reaction

BIBLIOGRAPHY