

Metabolic Reactions of Henri Type and Their Usage in Metabolic and Cell Growth Models

Stanko Dimitrov¹, Svetoslav Markov²

¹Faculty of Mathematics and Informatics, Sofia University “Kl. Ohridski”

²Institute of Mathematics and Informatics, Bulgarian Academy of Sciences
stankod@fmi.uni-sofia.bg, smarkov@math.bas.bg

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We study mathematically and computationally time-course experimental data of metabolic processes and batch fermentation processes. The measurement data are given together with bounds for the involved systematic errors. We describe and motivate our modelling approach on the case study with the Henri-Michaelis-Menten (HMM) biochemical reaction of the enzyme-substrate dynamics where two fractions of enzymes (free and bound) are involved. We discuss i) computational approaches and tools for the estimation of the rate parameters from time-course measurements; ii) the application of Henri reaction mechanism in metabolic networks and cell growth models. In the latter case, two fractions of the bacterial cells are considered: dividing and non-dividing cells. The Henri reaction scheme is used to describe the transition of bacterial cells from one fraction to another as well as the cell growth due to substrate uptake. Interval methods and advanced computational tools are used whenever model validation issues are discussed.

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