

On the Mathematical Modelling of Nitrate Reduction Using Reaction Schemes

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Experimental data for nitrate reduction including bacterial biomass, substrate and product are obtained together with bounds for the systematic errors in the data [1]. We analyse the data using a modelling approach close to enzyme kinetic and more specifically to Henri-Michaelis-Menten (HMM) biochemical reaction approach. To this end two phases (fractions) of the bacterial cells are considered: dividing and non-dividing cells and HMM-type reactions are used to describe the transition of bacterial cells from one phase to another as well as the product synthesis and cell growth due to substrate consumption and metabolic conversion [2]. The reaction schemes are formulated with a strong emphasis on the enzymatic competence of the cells as well as their reproduction abilities. The aim of this study is to confirm or reject the proposed reaction schemes as possible cell growth mechanisms. To this end we use verification interval methods and advanced computational tools.

References

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