Dynamic investigation and modeling of the nitrogen co-metabolism in Methylococcus capsulatus (Bath) - DTU Orbit (26/08/2019)

Dynamic investigation and modeling of the nitrogen co-metabolism in Methylococcus capsulatus (Bath)
The methanotrophic bacterium Methylococcus capsulatus is capable of assimilating methane and oxygen into a protein rich biomass, however the diverse metabolism of the microorganism also allows for several undesired co-metabolic side-reactions to occur. In this study, the ammonia co-metabolism in Methylococcus capsulatus is investigated using pulse experiments. Surprisingly Methylococcus capsulatus oxidizes ammonia to nitrate through a yet unknown mechanism, and fixes molecular nitrogen even at a high dissolved oxygen tension. The observed phenomena can be modeled using 14 ordinary differential equations and 18 kinetic parameters, of which 6 were revealed by Morris screening to be identifiable from the experimental data. Monte Carlo simulations showed that the model was robust and accurate even with uncertainty in the parameter values as confirmed by a statistical error analysis.

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