

Model-based Control and Estimation of Sustainable Bioprocesses

Cupriavidus necator, also known as the “knallgas bacterium”, has been extensively studied due to its versatile use in industrial microbiology. During its growth, Cupriavidus necator can make use of gases such as carbon dioxide and produce useful side products. One of these side products is biodegradable plastics, which is why the cultivation of these bacteria is highly relevant for the sustainable production of alternatives to petroleum-based plastics. Additionally, the utilization of CO₂ could reduce the impact it has on the atmosphere.

Bioprocesses are difficult to model and describe due to the complex interplay between chemical reactions, bioreactor setups and stochastic nature of the bacteria themselves. Thus, the goals of this project are:

- Modeling of chemical reactions and behavior of bacteria inside bioreactor
- Development of estimation and control algorithms
- Evaluate the model and performance of algorithms during experiments

