

**Title Title Title Title Title Title Title Title Title Title Title Title Title Title Title Title Title Title**

**Your name - Dissertation**



Figure(s) of your choice

(can be several small figures or a big one)

# Cover Page

# Title Page

**Title of the thesis**

vorgelegt von

M. Sc.

Name Surname

ORCID: 0000-xxxx-xxxx-xxxx

an der Fakultät III – Prozesswissenschaften

der Technischen Universität Berlin

zur Erlangung des akademischen Grades

Doktorin der Ingenieurwissenschaften

- Dr.-xxx -

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Tag der wissenschaftlichen Aussprache: xx. month year

Berlin year

# Abstract

* *1 page max.*
* *Abstract is necessary in English AND German.*
* *Content: One sentence introduction, background, aim of the work (scientific niche and how to solve it), results (most important, be specific, take it from the 10 Theses of the work), conclusion (importance to the field).*

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# Zusammenfassung

* *1 page max.*
* *Abstract is necessary in English AND German.*
* *Content: One sentence introduction, background, aim of the work (scientific niche and how to solve it), results (most important, be specific, take it from the 10 Theses of the work), conclusion (importance to the field).*

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# Acknowledgements

* *Must contain funding sources / financial support, incl. projects with project number.*
* *Must contain all people that contributed to thesis (as the thesis is a single person authorship publication and only in this chapter there is space to articulate contributions). Missing the announcement of contributors is a scientific fraud (same as if you would leave an author away in a publication).*
* *In cumulative thesis: also, all co-authors of publications have to be listed.*

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# List of Abbreviations

**General**

*E. coli Escherichia coli*

MTP Microtiter plate

OD600 Optical density at 600 nm

R² Coefficient of determination

**Symbols**

setpoint for specific growth rate in substrate-limited fed-batch phase (h-1)

# List of Publications

This thesis is based on the following publications, which either have been published in peer-reviewed journals, or are currently under consideration by peer-reviewed journals. They are listed in chronological order.

# denotes an equal contribution of these authors

For contributions according to (Brand et al., 2015) see chapter Publications.

First author publications discussed in this thesis:

1. **Kemmer, A.**#, Cai, L.#, Cruz Bournazou, M. N., & Neubauer, P. (2023) High-Throughput Expression of Inclusion Bodies on an Automated Platform. In *Inclusion Bodies – Methods and Protocols* (1st ed.). Springer Protocols. <https://doi.org/10.1007/978-1-0716-2930-7>
2. **Kemmer, A.**#, Fischer, N.#, Wilms, T., Cai, L., Groß, S., King, R., Neubauer, P., & Cruz Bournazou, M. N. (2023) Nonlinear state estimation as tool for online monitoring and adaptive feed in high-throughput cultivations. *Biotechnology and Bioengineering*. <https://doi.org/10.1002/bit.28509>
3. **Kemmer, A.**, Cai, L., Born, S., Cruz Bournazou, M. N., & Neubauer, P. Modeling enzyme-mediated glucose release to facilitate continuous feed in miniaturized cultivations.

Submitted to Frontiers in Bioengineering and Biotechnology on 23.12.2022

Further publications:

1. Anane, E., **Sawatzki, A.**, Neubauer, P., & Cruz-Bournazou, M. N. (2019). Modelling concentration gradients in fed-batch cultivations of E. coli – towards the flexible design of scale-down experiments. *Journal of Chemical Technology & Biotechnology*, *94*(2), 516–526. <https://doi.org/10.1002/jctb.5798>
2. Aizpuru, J., **Kemmer, A.**, Kim, J. W., Born, S., Neubauer, P., Cruz Bournazou, M. N., & Barz, T. (2022). Fitting nonlinear models to continuous oxygen data with oscillatory signal variations via a loss based on Dynamic Time Warping. *IFAC-PapersOnLine*, *55*(7), 216-221, <https://doi.org/10.1016/j.ifacol.2022.07.447>
3. …

# Introduction

* *1-2 pages max.*
* *Should introduce to the general subject of the thesis and sum up the structure of the work (overview).*
* *Must describe the scientific gap, niche.*
* *Clearly different from literature review!*
* *Should not double with abstract!*

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# Scientific Background

* *Presents state of the art.*
* *Should be written like journal or book review. List most important articles in relation to thesis / your research.*
* *Focus on most recent articles / literature. (It is important to focus on articles of the last* ***3-5 years*** *to show that your research is at the edge of science.)*
* *Beside understanding of the topic, it helps to connect to results and to discussion.*
* *Chapters can have subtitles, which represent the different subjects that have to be introduced.*
* *Self-citing should be avoided and better placed into the results part (for cumulative thesis). Always avoid self-copying / self-plagiarizing!*
* *However, an own review can be integrated as a chapter or parts of it can be integrated in the text (if the review covers more than the thesis field). Indicate on the first relevant page as a footnote or in the section title: “parts of it were taken from …” and modify).* ***(Discuss this with your main supervisor!!!!)***
* *This review also needs to be listed in the publication list at the end as well in cumulative case.*

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# Research Questions / Hypotheses

* *Should introduce research questions (RQ1-x) / tasks /aim 🡪 then answer questions in the discussion, confirm or refute.*
* *These questions can also be hypothesis driven (research hypotheses).*
* *Give short explanations (1-2 sentences) about the meaning of the questions / hypothesis and about the plan and actions how they should be answered / confirmed. Good example is Haringa:* [*https://repository.tudelft.nl/islandora/object/uuid%3A441ec955-cd8d-4ae0-b2f0-98fbf91a570a?collection=research*](https://repository.tudelft.nl/islandora/object/uuid%3A441ec955-cd8d-4ae0-b2f0-98fbf91a570a?collection=research)*.*
* *Questions need to be answered, hypothesis confirmed or refuted in the discussion.*
* *Discussion can be structured accordingly 🡪 subchapters, for example.*
* *It is important to think in advance whether you decide for research questions or research hypotheses. The way or your decision has consequences for the discussion part (answering a question, evaluation of a hypothesis (accepting/rejecting).*

Here first: short introduction into the topic/general aim.

1. *Research question 1? / Hypothesis 1.*

Answer or explanation 1.

1. *Research question 2? / Hypothesis 2.*

Answer or explanation 2.

1. *Research question 3? / Hypothesis 3.*

Answer or explanation 3.

1. *Research question 4? / Hypothesis 4.*

Answer or explanation 4.

1. *Research question 5? / Hypothesis 5.*

Answer or explanation 5.

# Materials & Methods

* *Should be structured like in an article, not like an SOP.*
* *In cumulative thesis: can be very short, do not repeat all the details of the publications (you can refer to them for details).*
* *might be different from case to case, no absolute format for all*

## Second level numbered heading

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Here goes a picture.

Figure 4.1. Figure subtitle.

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# Results

* *Cumulative thesis: Summarize your results of all papers. Refer to the papers either in the text or the headlines of sub-chapters. Sub-chapters can be ordered according to the paper order or according to experimental series, or similar …*
* *Monography: like in master thesis (end with best/most important result). Create sub-chapters.*

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On the following page is an example for a horizontal page.

Here goes a picture.

Figure 5.1. Figure subtitle.

# Discussion

* *Generally, the discussion has a length of 10-20 pages.*
* *Discuss own results in relation to literature / state of the art, which you described in the scientific background.*
* *What is your contribution to science (and society)?*
* *How do your results improve the state of the art?*
* *Discussion starts from most important research questions and results (start with your general task/niche). This is different to the results section. Then go into details.*
* *Also needed for cumulative thesis, where each paper has discussion. But then wrap the discussion up / summarize for all, do not repeat it from the papers.*
* *Holistic approach: See the overall thesis, do not necessarily separate the discussion into the different papers (sometimes however it may make sense if the papers have different contents)  see the whole story.*

## Second level numbered heading (RQ1 / H1)

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| **RQ1 / H1** | **Research question / hypothesis in same wording as in section 3** |

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## Second level numbered heading (RQ2 / H2)

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| **RQ2 / H2** | **Research question / hypothesis in same wording as in section 3** |

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# Conclusions & Outlook

* *Conclusions and outlook can be written in one section or separated.*
* *What do you really conclude from your own work?*
* *What do you expect where the field of science is developing?*
* *What should other scientists consider because of your own contribution?*
* *What follows after your work?*
* *What do you propose? What is your vision?*
* *If you fail to answer any of your research questions, you might put it here as an outlook. But you need to discuss it!*
* *Avoid references / citations in this chapter.*

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# Ten Theses

* *Written at the end of the thesis part (before the papers in cumulative case).*
* *10 most important hypotheses should sum up the results of the work.*
* *Try to be as specific as possible!*
* *Definition of a thesis (These):*
  + *Theses are statements/claims resulting from the results of the work, for which proof was obtained within the framework of the results produced in the work.*
  + [*https://wortwuchs.net/these/*](https://wortwuchs.net/these/) *(German)*
  + [*https://writingcenter.unc.edu/tips-and-tools/thesis-statements/*](https://writingcenter.unc.edu/tips-and-tools/thesis-statements/)
  + [*https://penandthepad.com/how-8229968-write-thesis-statement-science-report.html*](https://penandthepad.com/how-8229968-write-thesis-statement-science-report.html)
* *You can also include 1-2 broader societal hypotheses based on the work. Nice examples can be found in Dutch theses.*
* *The 10 theses are a good basis for a condensed and specific abstract.*

The following theses represent a condensed summary of the scientific results of this thesis:

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10. Lorem ipsum dolor sit amet.

# **References**

Brand, A., Allen, L., Altman, M., Hlava, M., & Scott, J. (2015). Beyond authorship: Attribution, contribution, collaboration, and credit. *Learned Publishing*, *28*(2), 151–155. https://doi.org/10.1087/20150211

# Appendix

## Second level numbered heading

Table A.1. Heading of table.

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Description** | **Unit** | **Value** |
|  | Maximum specific substrate uptake rate | gg-1h-1 | 1.3 |
|  | Carbon concentration in the product | mol C g-1 | 0.044 |

# Publications

* *Attach papers and manuscripts at the end of the thesis: formatted as in journal, with permission of the journal 🡪 complications might occur with the TU library if the papers are formatted differently in the thesis.*
* *An empty page (front side and back side) containing only the number of the following paper on the front side should be placed between the papers for separation (see following examples). This page should always start with the number in a block (functioning as a marker when the book is closed) on the right side.*
* *For the figures of own articles permission must be asked too (try to avoid copying figures). Alternatively, adapt figures.*
* *If a manuscript is attached, figures should not be placed in the end of the manuscript but incorporated into the text.*

## Paper I

**I**

**I**

Dummy text

Dummy text

**Paper I**

**Kemmer, A.**#, Cai, L.#, Cruz Bournazou, M. N., & Neubauer, P. (2023) High-Throughput Expression of Inclusion Bodies on an Automated Platform. In *Inclusion Bodies – Methods and Protocols* (1st ed.). Springer Protocols. <https://doi.org/10.1007/978-1-0716-2930-7>

**Author contributions:**

|  |  |
| --- | --- |
| **Annina Kemmer**: | Conceptualization, writing – original draft, writing – review & editing, visualization |
| Linda Cai: | Writing – original draft, writing – review & editing, visualization |
| M. N. Cruz Bournazou: | Writing – review & editing, supervision, funding acquisition |
| Peter Neubauer: | Conceptualization, writing – review & editing, supervision, funding acquisition |

**Own contributions:** outlined the structure of the book chapter; wrote most of the sections materials, methods and notes; drafted and created most of the figures; responsible for revision of the publication

**Information regarding re-use of the following published manuscript in this thesis:** This is the published version of the following book chapter: Kemmer, A., Cai, L., Cruz Bournazou, M. N., & Neubauer, P. (2023). High-Throughput Expression of Inclusion Bodies on an Automated Platform. In *Inclusion Bodies—Methods and Protocols* (1st ed.). Springer Protocols; Humana New York, NY. https://doi.org/10.1007/978-1-0716-2930-7. Reproduced with permission from Springer Nature.

## Paper II

**II**

**II**

Dummy text

Dummy text

**Paper II**

… see paper I

## Paper III

**III**

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**Paper III**

… see paper I

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