

Master's Thesis

Ultra-/Diafiltration in mRNA Downstream Purification

Keywords: mRNA manufacturing, Filtration, Precipitation

Project Description

The production of mRNA-based vaccines requires highly efficient downstream purification to ensure product quality and meet the demands of large-scale manufacturing. Traditional purification methods often rely on chromatography, which, while effective, can significantly increase process complexity and cost. This thesis explores an alternative approach that employs filtration-based purification under dynamic buffer conditions, utilizing different membrane systems to achieve impurity removal without chromatography. The work will focus on the development and automation of a filtration process for mRNA, including precipitation steps as part of the purification strategy.

This research offers an opportunity to contribute to the development of scalable, cost-effective purification technologies that support the rapidly growing field of mRNA therapeutics.

Tasks

- Conduct a literature review on Filtration applications in mRNA purification, precipitation and process control
- Performing Ultra and Dia- Filtration Processes, and general handling of mRNA processes
- Performing process analytics with state-of-the-art HPLC systems
- Optimization of filtration process parameters
- Data Evaluation (modeling of filtration process, if fitting)

Profile

- Enrolled in a master's program in Mechanical Engineering, Process Engineering, Biotechnology, or a related discipline
- Prior experience in laboratory work, ideally with analytical instrumentation or bioprocessing
- Ability to work independently with a structured, solution-oriented, and creative approach
- Basic programming skills (e.g., Python) and familiarity with data analysis are a plus
- Interest in biopharmaceutical manufacturing and process analytical technologies (PAT)

Start: January 2026

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The exact scope and content of the thesis may be subject to adjustments based on project developments and ongoing research priorities.