Bachelor's/ Master's/ Semester Thesis

Digital membrane chromatography – design of a sustainable separation process for the biopharmaceutical industry

Keywords: Sustainable processes, process development, membranes, electrosorption, biotherapeutics

Project Description

Chromatographic techniques play an essential role in the separation and recovery of biopharmaceuticals. However, traditional chromatography methods require highly functionalized stationary phases and large amounts of elution media to bind and elute the desired target molecule. This results in significant waste streams, costly processes and complex multi-step procedures.

This project addresses the development of an industrially relevant separation process using metallized membranes as innovative stationary phase. These novel membranes can be influenced in their surface charge and consequently their binding character solely by applying an electrical potential.
Thus, biomolecule purification can not only be more sustainable but also more efficient and cost-effective.

The focus of this research work is not only the characterization of different material properties but also the investigation of the process fundamentals by means of different methodologies (chromatographic and electrochemical). In a further step, the process will be systematically characterized with respect to potential-driven binding, elution and separation of target molecules.

Experimental, constructive and simulative works are possible!
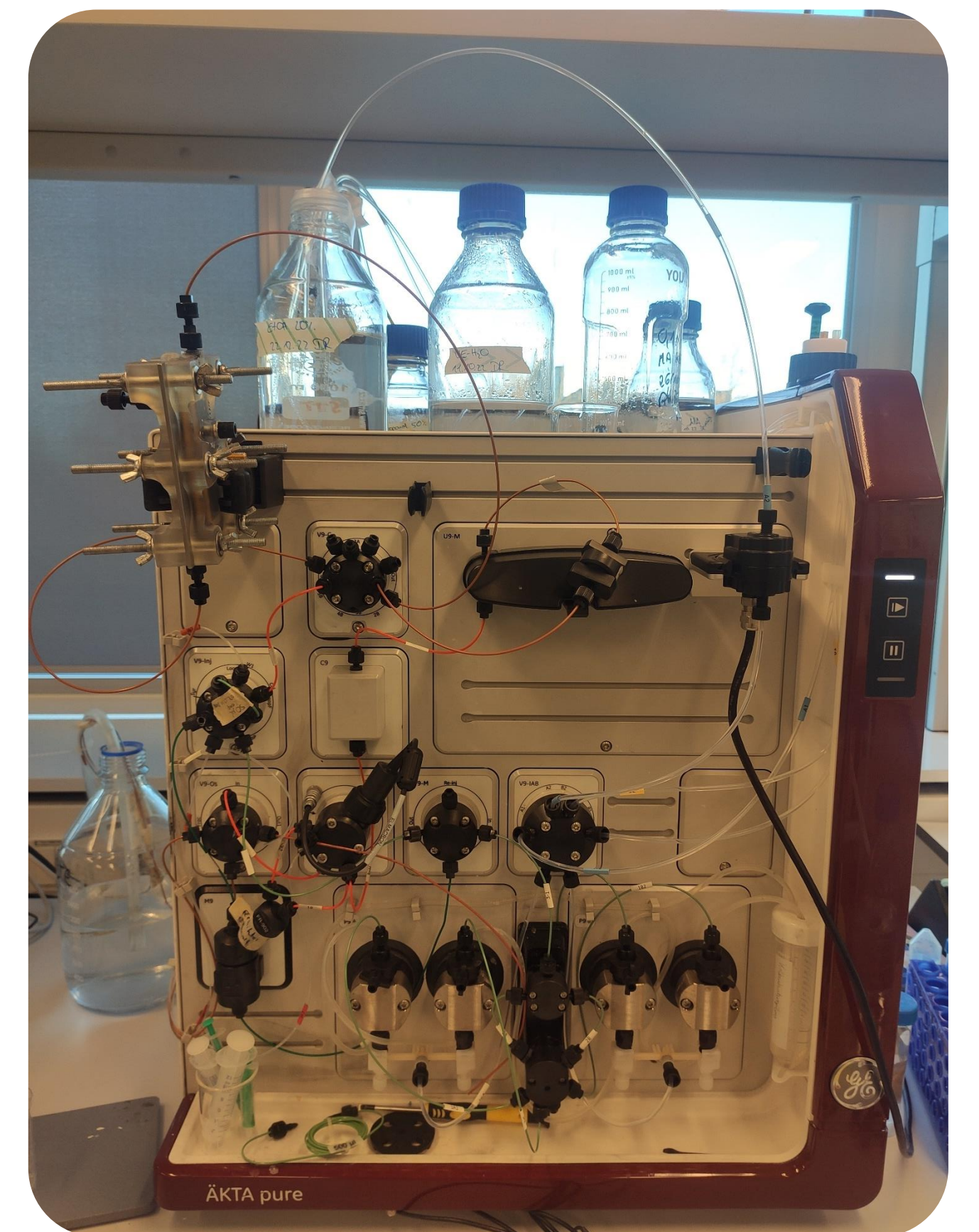
*Äkta pure – preparative chromatography plant*

Profile

- Structured and independent work
- Creativity and craftyness
- Chemical-, bioprocess-, mechanical-, medical-, engineering, or similar

Ideal, but not required:
- Lab experience

Digital membrane chromatography – working principle and potential dependent binding character
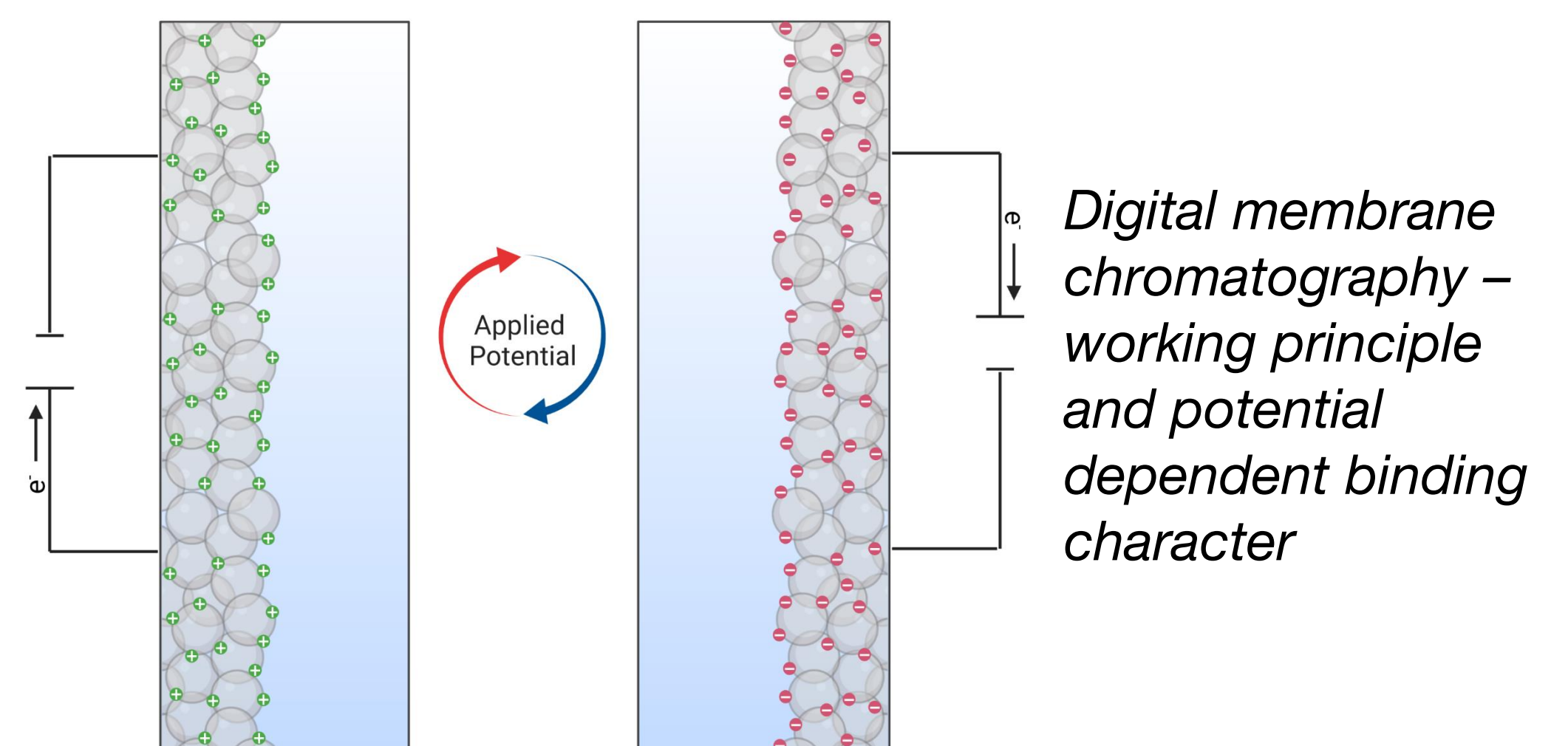
Tasks

1. Material and process characterization
2. Analysis of interfacial effects
3. Investigation of binding and purification effects of biopharmaceuticals
4. Methods & devices: preparative chromatography, BET, REM, EDX, DLS, IR, Raman etc...

Start: flexible
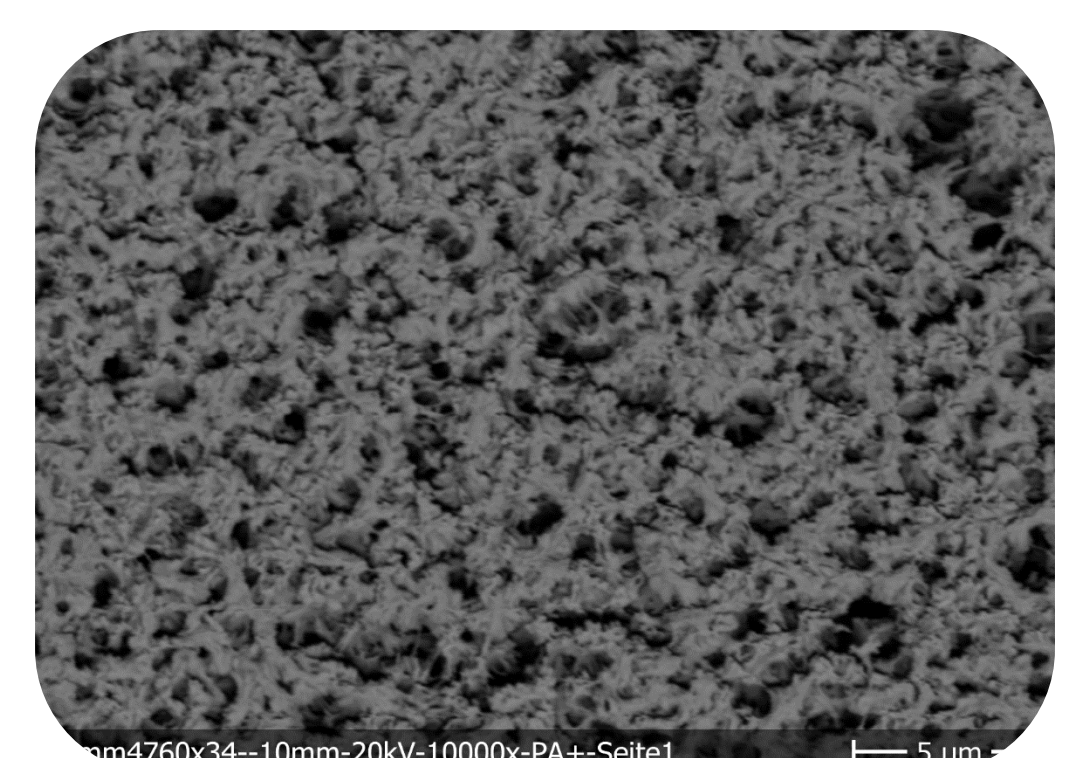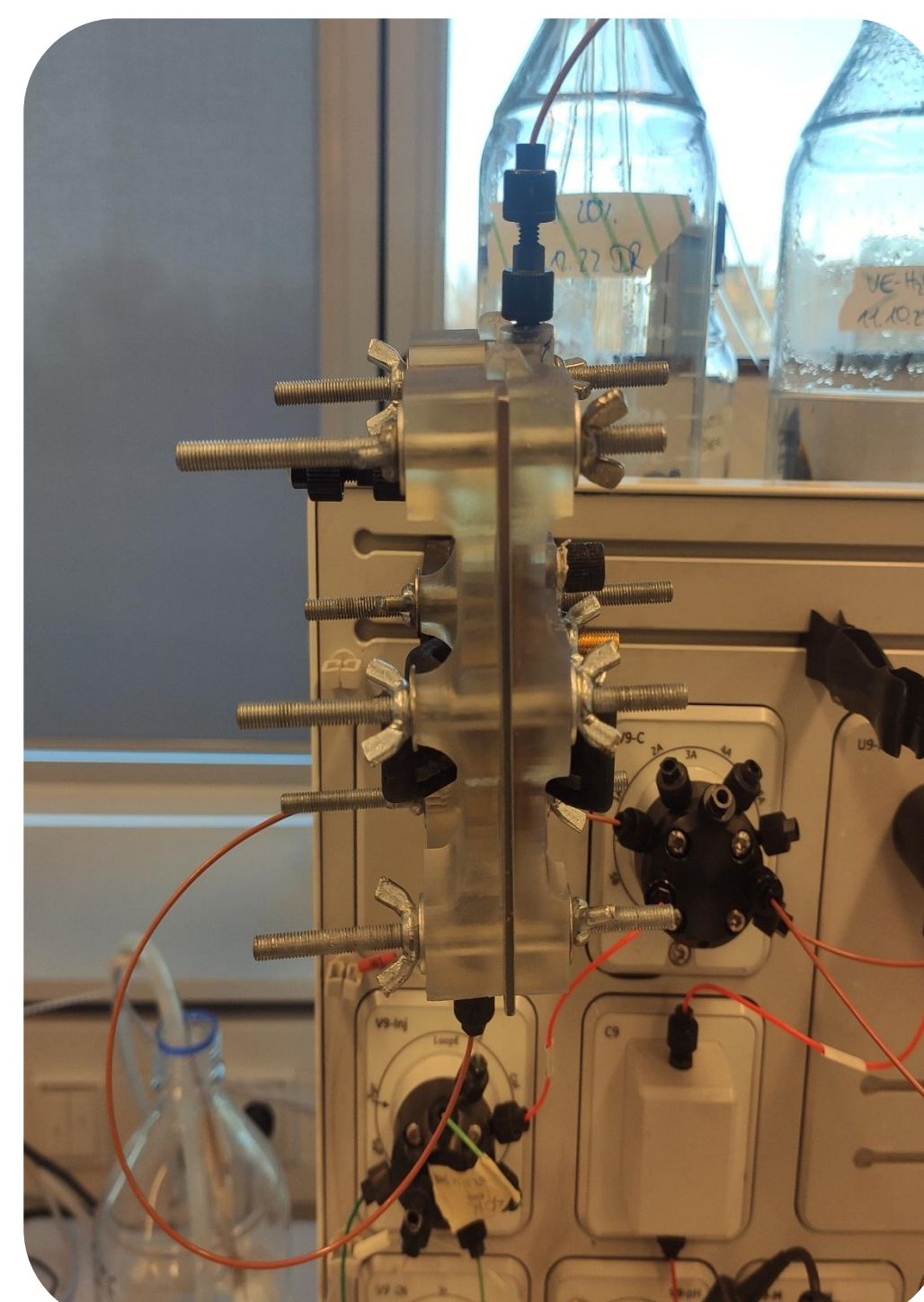
Left: Process setup for digital membrane chromatography

Right: REM imaging of metallized membranes

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