

Bachelor-/ Master Thesis

Advanced Characterization and Modeling of Electro-Modulated Separation in Gene Therapeutics

Keywords: Mechanistic Models, Process Optimization, Therapeutic plasmid DNA, Electro-modulated bioseparation

Project Description

Nucleotide-based gene therapeutics, such as mRNA and viral vectors, are highly relevant and rapidly growing areas in medicine. This project aims to advance an electro-modulated separation system for purifying highly negatively charged nucleotide-based therapeutics, eliminating the need for solvents or salts. Carbon-based electrodes will be tested as innovative chromatographic materials. The focus is on mechanistic modeling to understand the adsorption and desorption behaviors, including experimental tests using a dynamic flow cell module prototype with the ÄKTA system. The experimental data will be used to broaden the mathematical modeling and simulations in COMSOL Multiphysics Software to elucidate the physical interactions and optimize the process for industrial implementation.

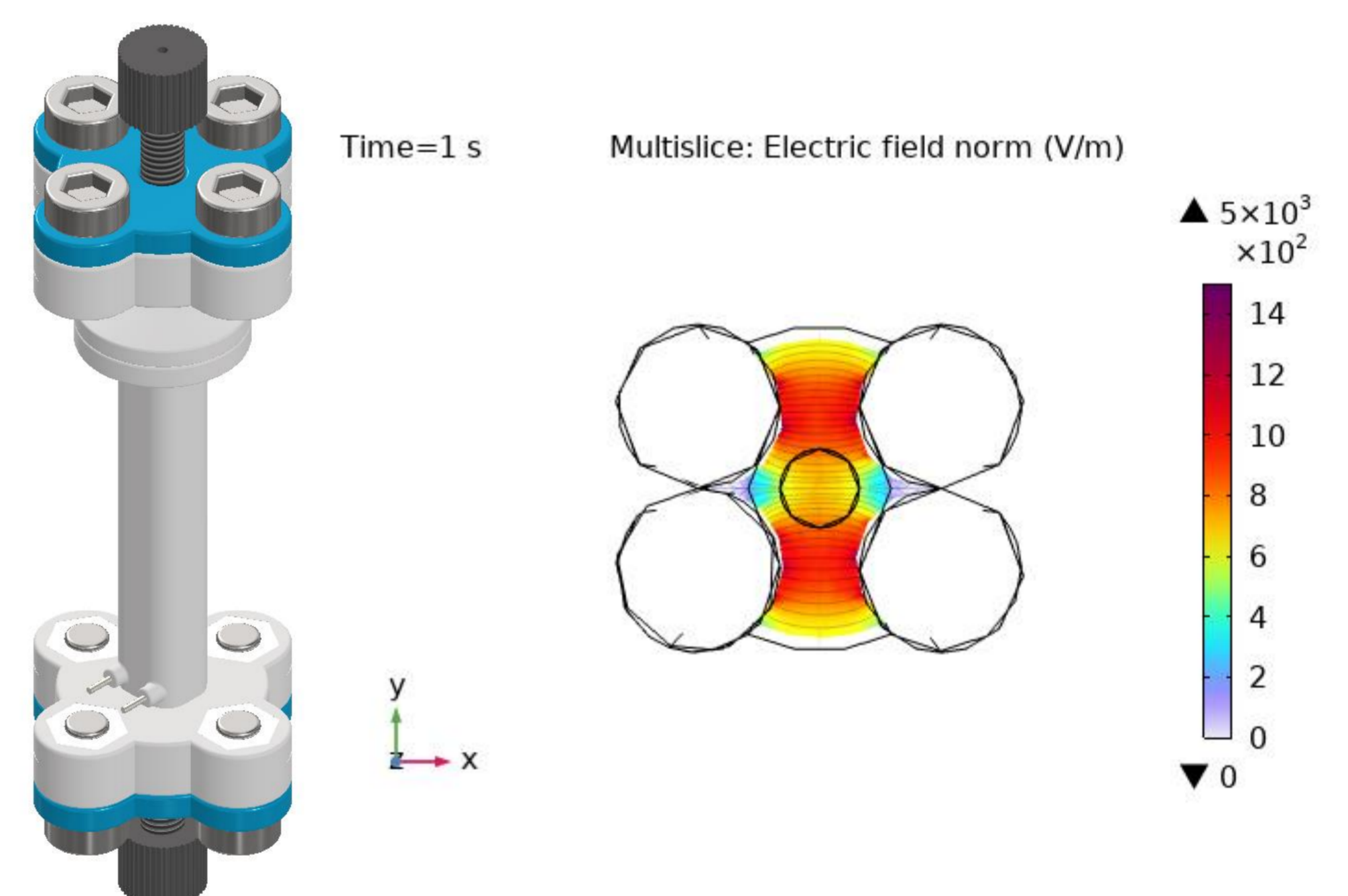
Please send your application along with your CV and current grade transcript to the email address below.

Research objectives

- Perform dynamic adsorption and desorption experiments
- Optimizing flow cell module design (Autodesk Inventor, 3D print)
- Testing conditions (buffer systems, potential, and flow)
- Improve and broaden mechanistic models and simulation in COMSOL Multiphysics software

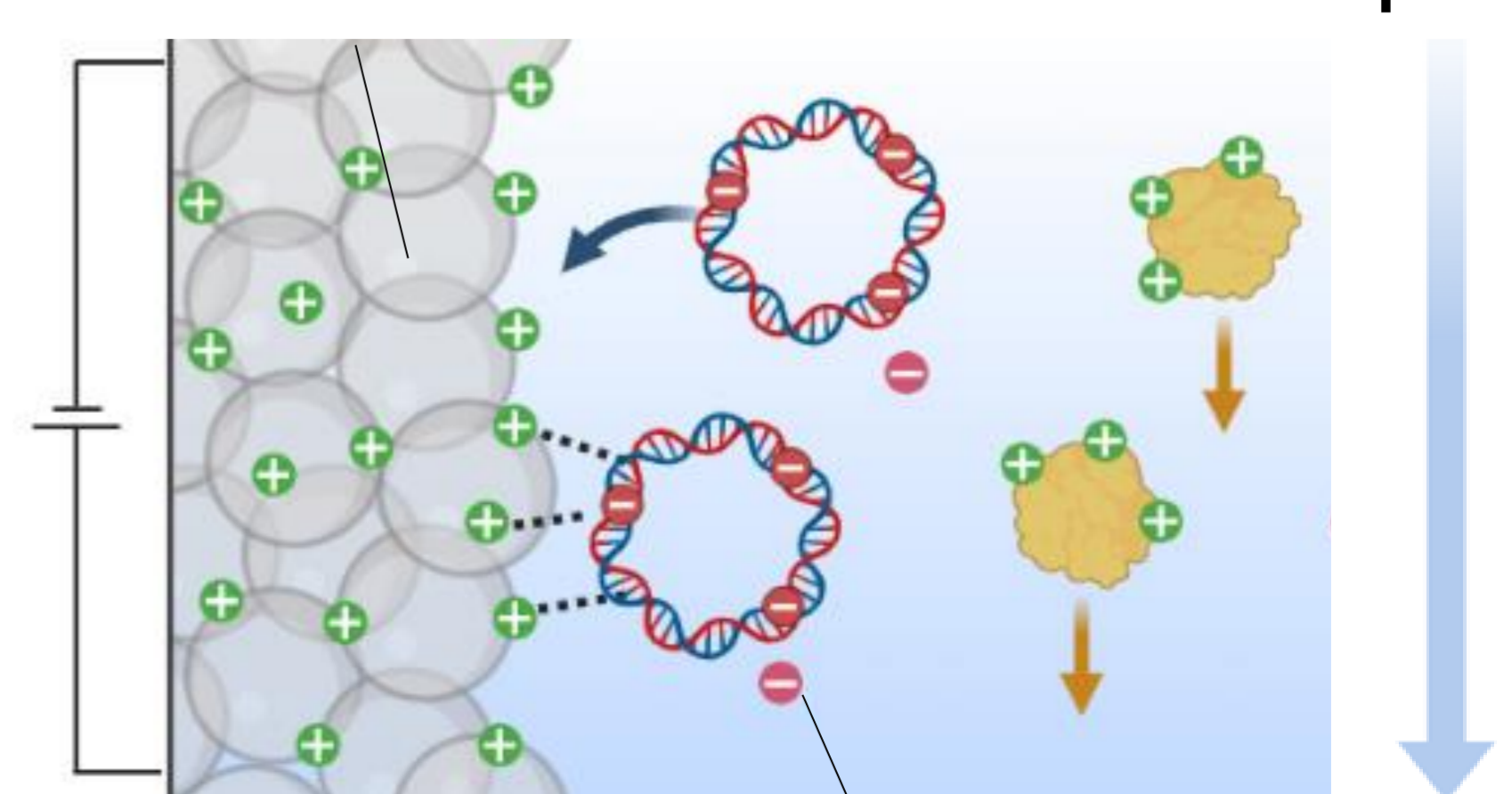
Profile

- Structured and independent workflow
- Creativity and craftyness
- Student in the field of Bioprocess-, Biochemical-Physical - Chemical-, Mechanical-, engineering, or similar
- Ideal, but not required: Lab experience, CAD



Carbon electrodes

Sample flow



Nucleotide therapeutics