Topics RE1/RE2 practical course WS 2026/27

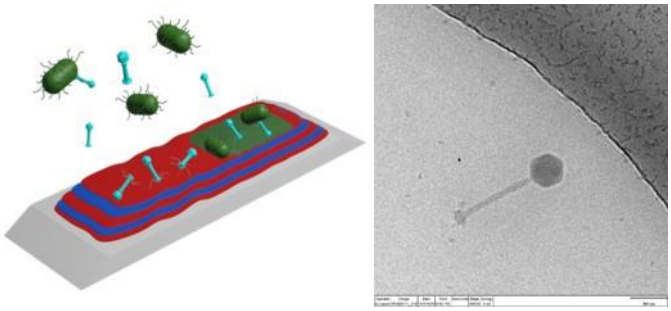
Title: Binding of bacteriophages at polyelectrolyte coatings

Abstract:

Implant-associated-infections (IAI) together with multi-drug-resistance (MDR) generate serious complications in orthopedic surgery burdening national healthcare systems. In our group (polyelectrolytes in medicine) both issues (IAI, MDR) are addressed by the equipment of model substrates and metallic implants with antibacterial polyelectrolyte coatings loaded by lytic bacteriophages (PHAG) specifically eradicating their host bacteria.

A critical step in the processing of such coatings is the binding of PHAG at the polyelectrolyte coating. This research topic will be focused on the preparation of polyelectrolyte coatings under combination of several polycations and polyanions and deposition of methicillin resistant Streptococcus aureus (MRSA) PHAG as well as model proteins.

The student will be introduced into preparative coating concepts based on polyelectrolyte complexation and into powerful analytical tools like in-situ attenuated total reflection Fourier transform infrared (ATR-FTIR) and ultraviolet/visible (UV/VIS) spectroscopy, spectroscopic reflectometry (SR), ellipsometry (ELL) and scanning force microscopy (SFM) aiming to optimize coating integrity and loading of PHAG and antibacterial activity.



Skills that you should already have:

- Knowledge/interest in polymer and/or colloidal chemistry
- Knowledge/interest in spectroscopic and microscopic analytical techniques
- Knowledge of basic lab equipment
- Independent work in chemical lab
- Scientific curiosity and communication skills

Skills that you will acquire during the internship:

- Experience and understanding of polyelectrolyte based coatings
- Experience with sorption phenomena of PHAG and proteins
- Experience in the usage of interfacial analytical tools like ATR-FTIR, UV/VIS, ELL, SR, SFM