



PhD Program between the Freie Universität Berlin (FUB) and the China Scholarship Council (CSC)

**Open PhD Position at Freie Universität Berlin,
offered only to Chinese CSC scholarship candidates 2023**

Department/Institute: | Department Biology, Chemistry, Pharmacy /
Institute of Pharmacy |

Subject area: | Polymer Chemistry / Colloidal Chemistry /
Pharmaceutical Technology |

Name of Supervisor: | Prof. Dr. Daniel Klinger |

Number of open PhD positions: | 1 |

Type of the PhD Study: | Full time |

Project title: | Nanostructured Polymer Particles for Advanced Biomaterials |

PhD Project description:

From molecules to bio-inspired materials – Nature has the outstanding ability to create specific macroscopic functions by controlling shape and internal morphology of particle-based systems. In such a hierarchical approach, anisotropic compartments are combined with the precise spatial distribution of chemical functionalities. This accurate structural control leads to complex dynamic properties that are yet unmet in synthetic approaches.

In the Klinger group, we are striving for similar levels of control in new artificial nanoparticles with anisotropic shapes and complex internal morphologies. It is our aim to harness the power of such multifunctional nanoparticles in advanced applications ranging from nanopharmaceutics to photonic materials.

To participate in our quest to such nature-inspired materials, the candidate should impart new functionality into striped ellipsoidal block copolymer nanoparticles. Special emphasis of the project will be exploiting their reversible anisotropic shape change. This will enable their utilization as new targeting concept in pharmaceutical applications or as new building blocks for smart actuating materials, i.e. artificial muscles.

To successfully realize this project, concepts from synthetic macromolecular chemistry should be combined with methods from the fields of colloidal chemistry and block copolymer phase-separation. Thus, this multidisciplinary project includes synthesis and characterization of the respective (macro-)molecular building blocks, their assembly into nanoparticles, characterization of the colloidal materials, and investigations on the resulting macroscopic functionality.

Language requirements:

- Excellent English language skills required
- IELTS: 6,5 oder TOEFL: 95 ibt

Academic requirements:

- Completed university degree (Master) in chemistry, materials science, polymer science or closely related fields
- Sound knowledge and practical expertise in organic chemistry / polymer chemistry / colloidal chemistry

Information of the professor or research group leader (website, awards etc.):

Research in our group focuses on functional polymer nanoparticles that can change their properties in response to external stimuli. By working on the design, synthesis, and characterization of such particles we can adjust their properties to specific applications in drug delivery and biomaterials:

On one hand, we develop stimuli-responsive nanocarriers to control the delivery of hydrophobic drugs. For example, we work on smart nanocarriers to increase the therapeutic potential of antibiotics of last resort. In addition, we examine amphiphilic nanogels to enhance the delivery of drugs into the challenging biological barrier of skin.

On the other hand, we develop new strategies to control shape and morphology of polymeric nanoparticles to realize advanced materials such as shape changing materials for targeting cellular uptake or the generation of colloidal actuators.

In both research areas, we combine concepts from polymer chemistry with interfacial physics and self-assembly to create versatile dispersed colloids with novel properties. To test these colloidal materials in the context of their (biological) application, we can rely on a broad set of experimental techniques and are also closely working together with several national and international research groups.

All these projects are tackled by our diverse research group that consists of members from a variety of different research backgrounds (from chemistry over engineering to pharmacy). Thus, our multidisciplinary research environment offers a great opportunity for a new member to expand his/her expertise in a variety of fields.

Additional information about our research, the group, and Prof. Klinger, can be found on our website:

<http://www.klinger-lab.de/>

Please Note: In a first step, the complete application should be uploaded to the [online portal \(https://fuberlin.moveon4.de/form/60acfece5d328710e40bdbd5/eng\)](https://fuberlin.moveon4.de/form/60acfece5d328710e40bdbd5/eng) for evaluation by January 15th, 2024. Please do not contact the professor before. He/she will get

in contact with you after having received the complete application via the International Office of Freie Universität Berlin in January.