

# Wahlpflichtfach

## Nanotechnologie

### **Synthesis, Use, Physico- Chemical Characterization and Toxicity Testing of Nanostructures**

Nanotechnology is regarded as one of the most important innovations of the 21st century. Nanomaterials (NM) are already used in many different applications, also in the medical field, for instance for bioimaging, tumor therapy or for drug delivery. NM can be synthesized in many different variants by using different core materials and by changing size, shape or surface. NM often display unique and enhanced physico-chemical properties compared to conventional materials. This seminar will give an introduction and an overview about different aspects of nanotechnology. The following topics will be covered: the synthesis and the characterization of NM as well as their interactions with biological systems covering *in vitro* and *in vivo* toxicity testing. In addition, this course will also deal with *in silico* methods for data evaluation, modelling and computer-based analysis of large data sets. *In silico* based methods are getting increasingly important for drug development, for the prediction of toxicity as well as for support safe-by-design approaches.

This seminar will address the following topics in an interdisciplinary manner:

- Introduction: nanostructures, possible use scenarios and applications
- Strategies and approaches for synthesis of NM
- Physico-chemical characterization (after synthesis, in situ)
- Interactions with biological molecules/ changes of NM properties in biological systems
- Toxicological characterization of NM in vivo and in vitro
- Ecotoxicological characterization of NM
- Exposure measurement and exposure modelling
- Uptake in cells and organisms, biokinetics
- Bioinformatic data evaluation: cluster analysis, PCA and QSAR approaches
- Practical exercises
- Risk assessment and regulation

This course is aimed at advanced students of pharmacy (6. semester or higher). It is also suitable for students of chemistry (Modul: Moderne Aspekte in der Chemie) or biochemistry (Modul: Spezielle Aspekte der molekularen Biomedizin). Interested PhD students are also welcome. The course will be held in German or English. Active participation of the students is expected. Additional materials (e.g. primary literature, reviews articles, materials for exercises) will be distributed. In addition, it will be possible to visit labs to get to know some of the methods, which will be discussed during the seminar. The seminar will cover 4 SWS. Additionally approximately 4 SWS are required for preparation and for the exercises. The seminar will be given by Prof. Christina Graf (Chemistry), Dr. Andrea Haase (Federal Institute for Risk Assessment) and Dr. Fiorenza Rancan (Charité). It will take place on Mondays, 10-12 am at the Institute of Chemistry (Takustrasse 3, room, 23.03, Prof. Graf) and on Thursdays, 6-8 pm at the Institute of Pharmacy (Königin-Luise-Str. 2+4, seminar room 1, Dr. Haase). **Organisatorische Details:** <http://www.bcp.fu-berlin.de/pharmazie/pharmakologie/Lehre/index.html>