Analytical Chemistry

Overview over the Focus (Elective) Analytical Chemistry in the MSc Chemistry 2025

Module	ECTS	Teachers
Class „Current Research and Applications in the Instrumental Analysis of Trace Components“ (Compulsory)	5	PD Dr. M. Seidel, Prof. Dr. M. Elsner, PD Dr. N. Ivleva, Prof. Dr. C. Haisch, Dr. R. Bakkour
Lab Course „Current Research and Applications in the Instrumental Analysis of Trace Components“ (Compulsory)	5	PD Dr. M. Seidel, Prof. Dr. M. Elsner, PD Dr. N. Ivleva, Prof. Dr. C. Haisch, Dr. R. Bakkour, Prof. Dr. N. Strittmatter
Research Lab (6 Weeks, Compulsory) 2. Research Lab (6 Weeks, Elective)	10 10	Prof. Dr. M. Elsner PD Dr. M. Seidel PD Dr. N. Ivleva Prof. Dr. C. Haisch Dr. R. Bakkour Prof. Dr. N. Strittmatter
Class „Case Studies in Analytical and Environmental Chemistry“ (Elective)	5	Dr. R. Bakkour
Class „Modern Mass Spectrometry - Instrumentation and Applications“ (Elective)	5	Dr. J. Lengyel, PD Dr. N. Ivleva, Prof. Dr. M. Elsner, Prof. Dr. N. Strittmatter
Class „Physico-chemical Aerosol Characterization“ (Elective)	5	Prof. Dr. R. Nießner, Prof. Dr. C. Haisch

Organisation: Prof. Dr. M. Elsner

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Organisation: Prof. Dr. M. Elsner

Current Research and Applications in the Instrumental Analysis of Trace Components Vorlesung und Praktikum

Chair of Analytical Chemistry and Water Chemistry
Institute of Hydrochemistry and Chemical Balneology
Technical University of Munich
Prof. Dr. M. Elsner

Lichtenbergstr. 4, 85748

Lead and Organization:
PD Dr. Michael Seidel
michael.seidel@mytum.de
https://www.ch.nat.tum.de/hydrochemistry/home/

Current Research and Applications in the Instrumental Analysis of Trace Components

Timeline

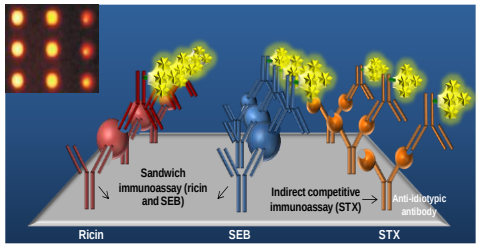
- **Registration in WS 2025/26 with Prof. Elsner**
- **Module can also be taken as elective**
- **Block course in the semester break (end of February until mid April)**
- **1 week class (5 ECTS)**
- **1 week lab course (5 ECTS)**

Examination

- **Lab course:**
  - Testat at the beginning of each day
  - Written documentation, evaluation, interpretation
- **Class**
  - Written or oral exam
  - Presentation of a case study

Current Research and Applications in the Instrumental Analysis of Trace Components

Class:

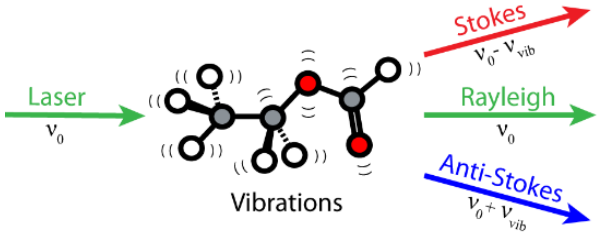


Mass Spectrometric Applications, Sampling, Org. Environ. Analysis (Prof. Dr. M. Elsner, Dr. R. Bakkour)

Microanalytic and Bioanalytic Measurement Methods (Microarray, Biosensors, Flow Cytometry, Microfluidics, Methods of Molecular Biology) (PD Dr. M. Seidel)

Statistics, Particle Measurements (Prof. Dr. C. Haisch)

Vibrational Spectroscopy and Imaging (Raman, IR, SEM, TEM) (Dr. N. Ivleva)



Lab Course

(Prof. Dr. M. Elsner, PD Dr. M. Seidel, Dr. N. Ivleva, Prof. Dr. C. Haisch, Dr. Rani Bakkour)

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Research Lab (6 Weeks, Compulsory)	10	Prof. Dr. M. Elsner PD Dr. M. Seidel PD Dr. N. Ivleva Prof. Dr. C. Haisch Dr. R. Bakkour Prof. Dr. N. Strittmatter
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Class „Physico-chemical Aerosol Characterization“ (Elective)	5	Prof. Dr. R. Nießner, Prof. Dr. C. Haisch

Organisation: Prof. Dr. M. Elsner

Research Lab

(Prof. Dr. Elsner, PD Dr. Seidel, PD Dr. Ivleva, Prof. Dr. Haisch, Dr. Rani Bakkour, Prof. Dr. Nicole Strittmatter)

Organization

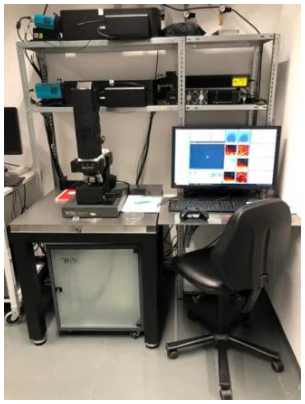
- **Registration anytime**
- **6 Weeks (WS & SS)**
- **Possibility to conduct an additional Research Lab (elective)**

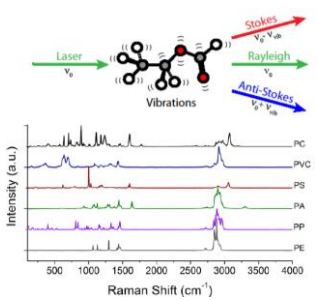
Examination

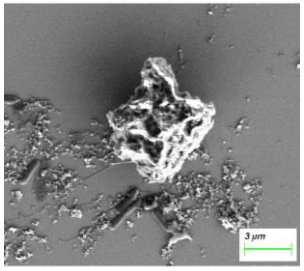
- **Practical work**
- **Report in the form of a short research article in English**
- **Presentation of the results (oral presentation in a group seminar)**

Current Research in Organic Trace Analysis

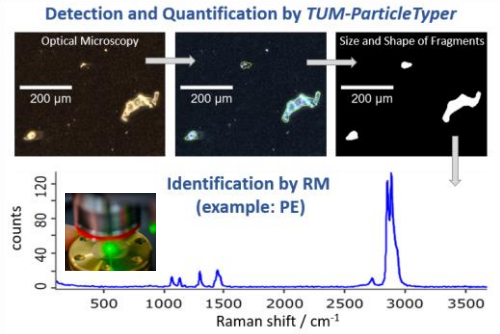
Raman & SEM analysis
(PD Dr. Natalia P. Ivleva)



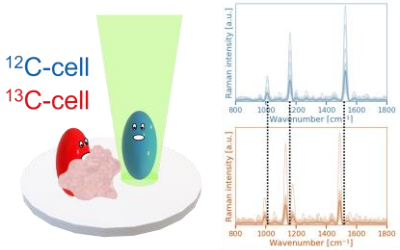




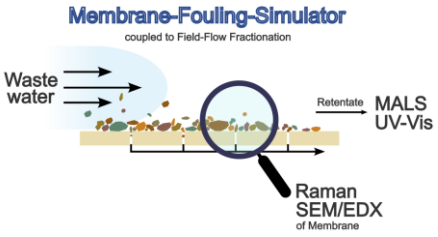
Automated analysis of (microplastic) particles and fibers down to 1 µm



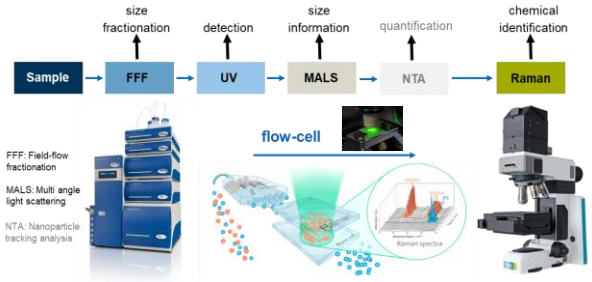
Stable isotope Raman microspectroscopy for studies of microplastic biodegradation



2D&3D analysis of surfaces / membranes and biofilms



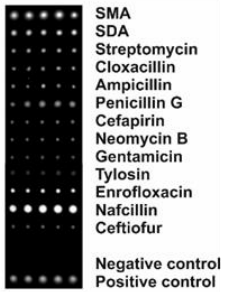
Phys.- chem. characterization of (organic) particles below 1 µm

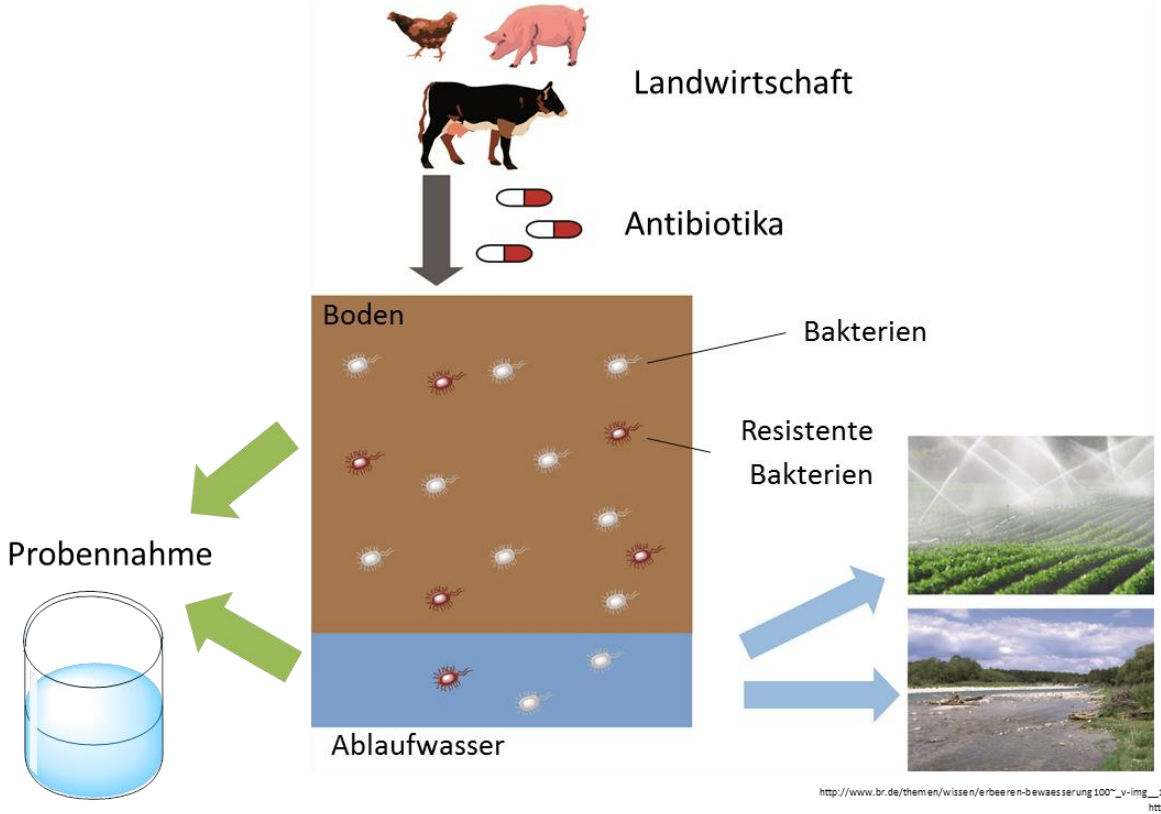


Current Research in Organic Trace Analysis

Bioanalytics of org. chemicals and pathogens
(PD Dr. Michael Seidel)

MCR3-Gerät





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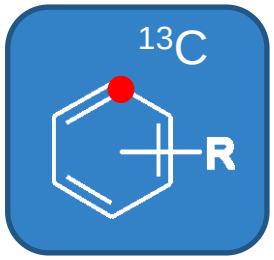
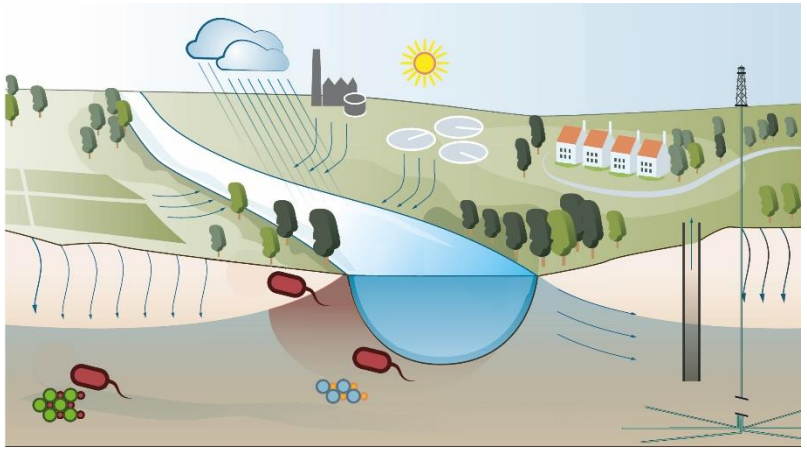
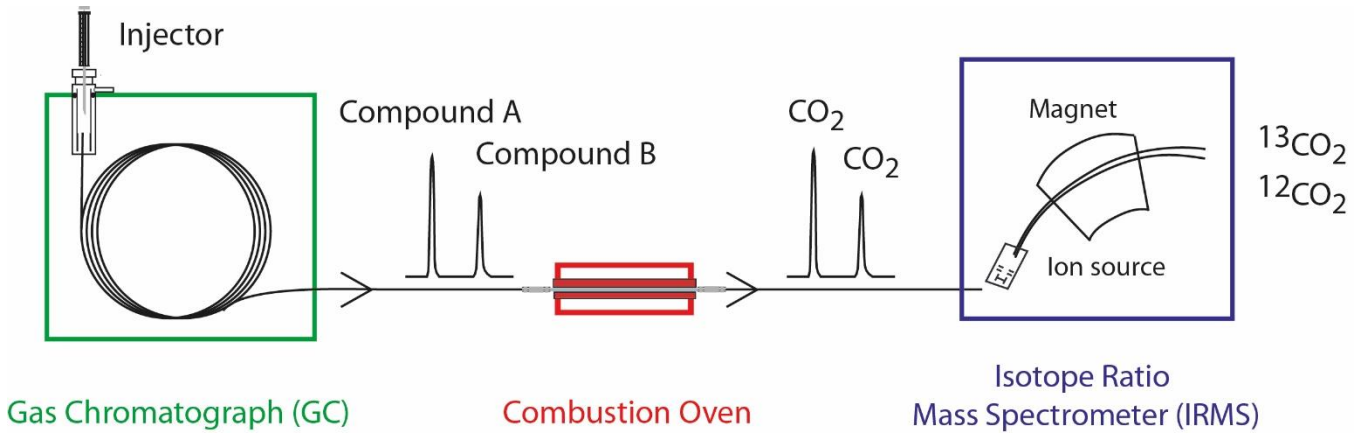
https://upload.wikimedia.org/wikipedia/commons/6/63/Isar_bei_Ascholding-1.jpg

Current Research in Organic Trace Analysis

Compound-specific isotope analysis of organic trace chemicals
(Prof. Dr. Martin Elsner, Dr. Rani Bakkour)



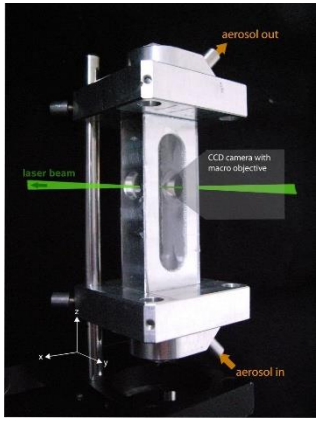




Current Research in Organic Trace Analysis

Prof. Dr. Christoph Haisch

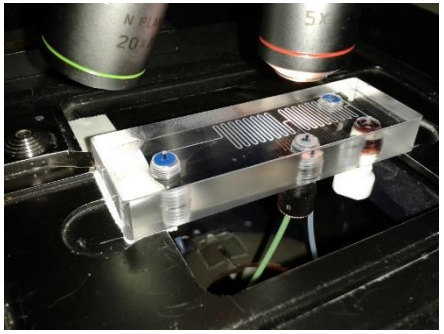
Development of
Devices and Methods



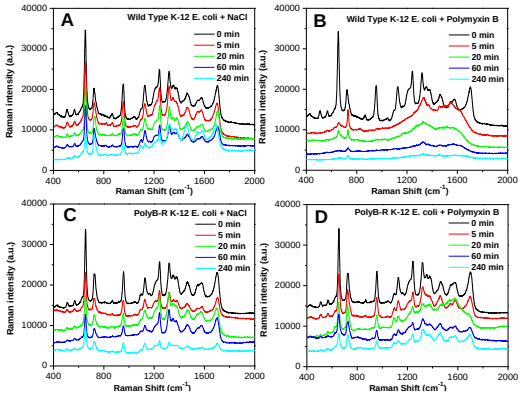
Exhaust Characterization
Zero-Emission Fuels

Prozess- and
Environmental Analysis

Antibiotika-resistance Tests



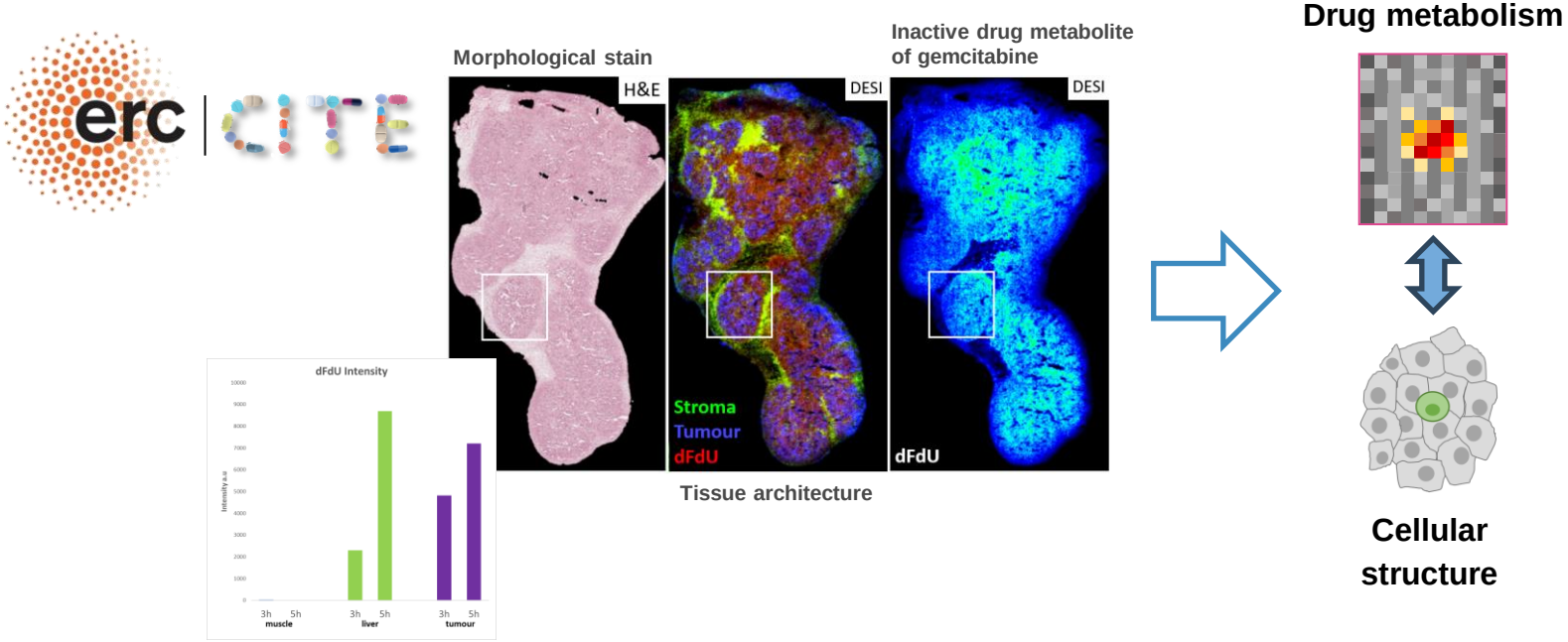
SERS, Raman
on Microorganisms



Prof. Dr. Nicole Strittmatter

Development of novel analytical methodologies and instrumentation to investigate small molecules <u>in situ</u> in complex, biological matrices

- Biomedical mass spectrometry
- Spatial metabolomics using MS imaging
- LC-MS/MS based analysis
- Drug delivery and metabolism
- DBDI to screen volatiles
- Samples: Organotypic models, tissues, cell cultures



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Class „Physico-chemical Aerosol Characterization“ (Elective)	5	Prof. Dr. R. Nießner, Prof. Dr. C. Haisch

Organisation: Prof. Dr. M. Elsner

Case Studies in Analytical and Environmental Chemistry (Elective)

- **Organization**: Dr. Rani Bakkour

- **Semester:** Summer Term

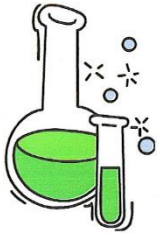
- **Topics:**

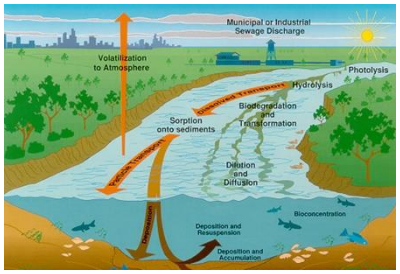
  - Fate and Analysis of Organic Contaminants in the Environment (e.g. PFAS, DDT, Nerve Agents, Chlorinated Hydrocarbons)
  - Transformation Reactions in the Environment (Photochemistry, Substitutions, Redox Reaktions, Biodegradation)

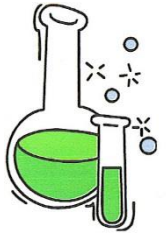
- **Examination**
  - **Presentation of Case Studies in the Form of a Poster, Oral Presentation and a Report**

Case Studies in Analytical and Environmental Chemistry (Elective)

Partitioning

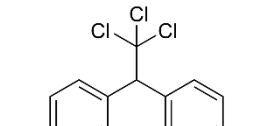


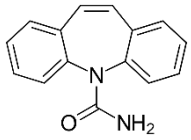


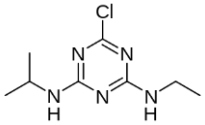


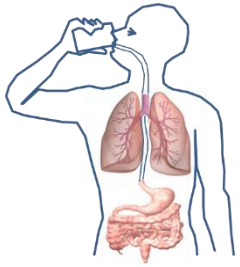
Reactivity

Environ. Compartments









Chemicals

Organisms

Analytical Chemistry

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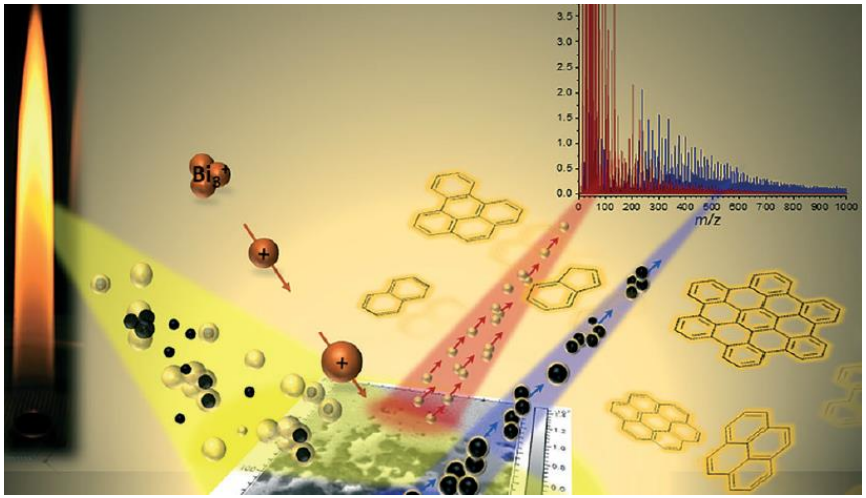
Class „Physico-chemical Aerosol Characterization“ (Elective)	5	Prof. Dr. R. Nießner, Prof. Dr. C. Haisch

Organisation: Prof. Dr. M. Elsner

Modern Mass Spectrometry – Instrumentation and Applications (Elective)



- **Organization**: Dr. J. Lengyel
  PD Dr. Natalia Ivleva
  Prof. Dr. Martin Elsner
  Prof. Dr. Nicole Strittmatter

- **Semester:** Summer Term

- **Topics:**
  - Strategies of Ionization and Ion Manipulation
  - Different Types of Mass Spectrometers
  - Coupling to Separation Techniques
  - Applications in Different Fields (Guest Lecturers)

- **Examination: Oral Presentations, Oral Exam**

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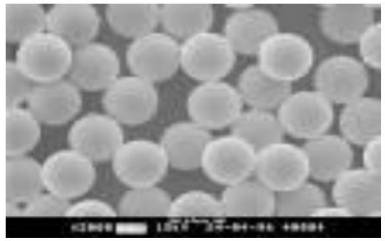
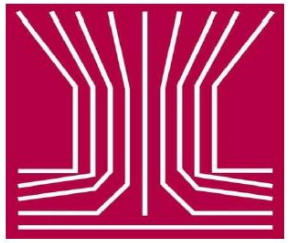
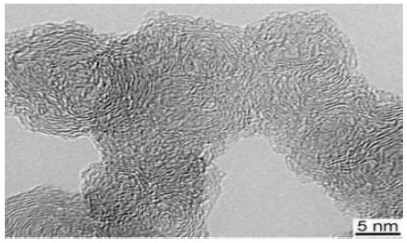
Class „Physico-chemical Aerosol Characterization“ (Elective)	5	Prof. Dr. R. Nießner, Prof. Dr. C. Haisch

Organisation: Prof. Dr. M. Elsner

Physico-chemical Aerosol Characterization (Elective)







- Importance, definitions
- Genesis of aerosols, natural vs. anthropogenic sources
- Properties & physical characterization
- Aerosol generation, sampling, filtration
- Analytical methods of chemical characterization