Module title: Chemical and Biosensors

Module summary
Module code: SSTM220
Module coordinator: Prof. Dr. Karsten Pinkwart
Credits (ECTS): 6 CP
Semester: 2
Pre-requisites with regard to content: Basic knowledge of sensor system technology and chemistry
Pre-requisites according to the examination regulations: none
learning outcomes and competencies: Upon successful completion, the students… … comprehend the fundamentals of chemo- and biosensors and can illustrate communalities and differences between these two sensor classes … can describe their technological implementation in particular of current and miniaturized sensor approaches, … are able to describe sensor applications and respective challenges of practical measurements This module extends the knowledge in sensor technology by the important field of chemo- and biosensors, which have a wide range of innovative applications. These sensor types are crucial not only in industrial processes and environmental monitoring, they are also vital for measuring certain parameters of living systems — e.g. in medical engineering. Furthermore, the development of miniaturized chemo- and biosensors as well as novel sensor materials is an active area of research. Consequently, students are introduced to recent sensor trends in academia and industry.
Assessment: Assessment is done by a written exam (120 minutes)

Course: Chemosensors
Module code: SSTM221
Lecturer: Prof. Dr. Markus Graf
Contact hours: 3 SWS
Semester of delivery: yearly, winter semester
Type/mode: lecture
Language of instruction: English
Content: An overview on the significance of chemical sensing for a wide range of applications such as environmental monitoring, process automation, human health, comfort and energy efficiency is given. Furthermore, a practical and highly relevant framework for assessing the requirements and performance of chemosensors is introduced. Fundamental chemical concepts are applied to understand typical sensor characteristics. Sensors are categorized according to their transduction principles: Mechanical, thermal and optical chemosensors including the recent miniaturization trends.

The chemosensor portfolio is further extended by the electrochemical transduction principle including potentiometric, amperometric and conductometric sensor types for e.g. pH, Oxygen and other important measurands.
Recommended reading: Lecture slides will be provided in the online learning system • Further Literature: • J. Janata, Principles of Chemical Sensors, Springer • P. Gründler, Chemical Sensors, Springer • F.-G. Banica, Chemical Sensors and Biosensors, Wiley • Fundamentals: • T. Brown et. al., Chemistry – The Central Science, Pearson, (SI units) • P. Atkins, J. de Paula & J. Keeler, Physical Chemistry, Oxford University Press
Comments: -

Course: Biosensors
Module code: SSTM222
Lecturer: Prof. Dr. Karsten Pinkwart
Contact hours: 1 SWS
Semester of delivery: yearly, summer / winter semester
Type/mode: lecture
Language of instruction: English
Content: • Elaboration of the special features of biochemical sensors as a subclass of chemical sensors and the necessary transduction processes • Comparison of biocatalytic and bioaffinity sensors and introduction of specific knowledge about antibodies and enzymes • Different possibilities for binding biomolecules to a sensor surface using self-assembly monolayers (SAM) and Langmuir-Blodgett layers (LBL) • Presentation of the routine steps for the complete construction of a biosensor using the example of nitroaromatic sensor technology • Examination of the various transduction methods using the example of the biosensor detection of β-D-glucose as the world's most common biosensor
Recommended reading: Lecture slides will be provided in the online learning system.
Comments: -