

Master Thesis Opportunity in Erlangen(at FAU)

Experimental Strategies for Dynamic VOC Gas Sensing

Background

Volatile organic compounds (VOCs) are relevant in many fields, including environmental monitoring, food quality assessment, indoor air analysis, and chemical communication. Low-cost gas sensors, such as metal oxide-based sensors, are promising tools for VOC detection. However, their selectivity can be limited, especially when different gases or complex backgrounds are present [1]. Previous studies have shown that dynamic sensor responses and time-dependent signal features can provide additional information for VOC discrimination [2]. At the same time, experimental parameters such as flow conditions, humidity, and temperature may strongly influence gas sensor responses and therefore need to be carefully controlled [3].

Aim of the Thesis

The aim of this thesis is to investigate how controlled experimental conditions influence dynamic gas sensor responses to selected VOCs. The project will focus on reproducible measurements, signal analysis, and the interpretation of time-dependent response patterns.

Possible Tasks

- Planning and performing controlled gas-sensing experiments
- Measuring selected VOCs under different experimental conditions
- Preprocessing and analyzing sensor time-series data
- Extracting basic dynamic response features, such as response intensity, response time, recovery behavior, and reproducibility
- Comparing and visualizing response patterns using statistical or data-analysis methods
- Summarizing experimental findings and methodological recommendations

Expected Outcome

The thesis will contribute to a better understanding of dynamic VOC gas-sensing measurements. The expected outcome is a structured experimental and analytical comparison of sensor responses under controlled conditions.

Student Profile

This topic is suitable for Master students interested in experimental work, gas sensing, signal analysis, and data interpretation. Basic programming skills, for example in Python or MATLAB, are helpful but not mandatory.

Application and Contact

Interested students are welcome to contact us for further information.

Supervisor: Kaikai Zhu

Chair: Chair of Aroma and Smell Research

Email: Kaikai.Zhu@fau.de

Starting date: tbd

Language: English

References

[1] Ponzoni et al., "Metal Oxide Gas Sensors, a Survey of Selectivity Issues Addressed at the Sensor Materials Level," *Sensors*, 2017. This supports the statement that metal oxide gas sensors are sensitive but often limited by selectivity issues.

[2] Acharyya et al., "Selective Discrimination of VOCs Applying Gas Sensing Kinetic Analysis over a Metal Oxide-Based Chemiresistive Sensor," *ACS Sensors*, 2021. This supports the use of dynamic/kinetic sensor response features for VOC discrimination.

[3] Robbiani et al., "Physical Confounding Factors Affecting Gas Sensors," *Chemosensors*, 2023. This supports the relevance of flow rate, flow direction, humidity, and temperature as confounding factors in gas-sensor experiments.