

## **Study on surface modification on metal oxide sensors for hydrogen by short-pulsed laser irradiation**

### ***Kurzbeschreibung***

#### **Motivation**

The effective (sensitivity) and precise (selectivity) detection of hydrogen is of great importance for the control of the chemical reaction process and the safety both in industrial production and in the application of hydrogen-based systems in everyday life. Semiconducting metal oxide sensors (MOx-sensors) have recently been intensively researched for this purpose. The group of IDT are working closely with DLR on the methods to enhance the performance of commercialized MOx-sensors by irradiation with UV short and ultrashort pulse lasers.

#### **Goal of the thesis**

The goal of this thesis is to define the influencing factor of laser parameters such as laser single pulse energy, pulse repetition rate, wavelength etc. on the chemical and physical properties of the MOx-sensors. In a first step, an overview on the existing subject area is to be established by means of literature research. Based on this, a design of experiments (DoE) will be developed and implemented in the scanner-based laser processing systems. Two wavelengths (515 nm and 355 nm) of laser beam source and two types of MOx-sensors will be used for this purpose. After implementation of the systematical investigation, the performance of the sensors will be compared and evaluated with reference sensors. In addition, the microscopic measurements and spectroscopic characterization will be conducted to investigate the influence of varied parameters on the performance of the modified sensors.

#### **Possible work packages**

- Literature research on the modification on MOx-sensors by pulsed laser irradiation
- Adaption of experimental setup
- Planning and execution of experiments
- Characterization and analysis of the physical and chemical properties of the modified sensor surface
- Evaluation and Documentation of the results and completion of thesis

#### ***Zuordnung zu laufenden Projekten***

Institut für Sicherheitsforschung

#### ***Ansprechpartner***

Prof. Dr. P. Kaul

#### ***Voraussetzungen / Anforderungen an Interessent:innen***

You are studying a subject of natural science or mechanical, electrical engineering and are interested in working on laser material processing together with a group of undergraduate and graduate students. Knowledge in laser material processing, material science, sensors, as well as programming is desired, but not required.