

## DocMASE Project Proposal 2015-UdS

Project Title	<i>Improving the performance of gas sensor systems with advanced data evaluation, operation, and calibration methods</i>
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Project Description	<p>In order to facilitate the widespread use of gas sensors, some challenges must still be overcome. Many of those are related to the reliable quantification of ultra-low concentrations of specific compounds in a background of other gases. This thesis focuses on three important items in the measurement chain: sensor material and operating modes, evaluation of the resulting data, and test gas generation for efficient sensor calibration.</p> <p>New operating modes and materials for gas-sensitive field-effect transistors have been investigated. Tungsten trioxide as gate oxide can improve the selectivity to hazardous volatile organic compounds like naphthalene even in a strong and variable ethanol background. The influence of gate bias and ultraviolet light has been studied with respect to the transport of oxygen anions on the sensor surface and was used to improve classification and quantification of different gases.</p> <p>DAV<sup>3</sup>E, an internationally recognized MATLAB-based toolbox for the evaluation of cyclic sensor data, has been developed and published as open-source. It provides a user-friendly graphical interface and specially tailored algorithms from multivariate statistics.</p> <p>The laboratory tests conducted during this project have been extended with an interlaboratory study and a field test, both yielding valuable insights for future, more complex sensor calibration. A novel, efficient calibration approach has been proposed and evaluated with ten different gas sensor systems.</p>