# Miniaturisierter Feuchtesensor


Graduate

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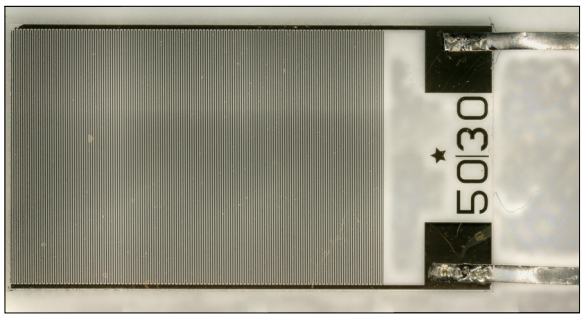
Introduction: This paper presents the development of a prototype sensor for measuring residual moisture in secondary batteries with plastic housings. Even very small amounts of moisture penetration can significantly impair the performance and service life of such batteries, which is particularly important in medical technology. The developed sensor is based on an impedance-based measurement principle that utilizes the formation of an electrochemical double layer. Thin glass plates served as the substrate, on which electrodes made of gold or platinum structures with dimensions in the micrometer range were manufactured. In addition, a gel electrolyte was applied so that a functional sensor could be produced.

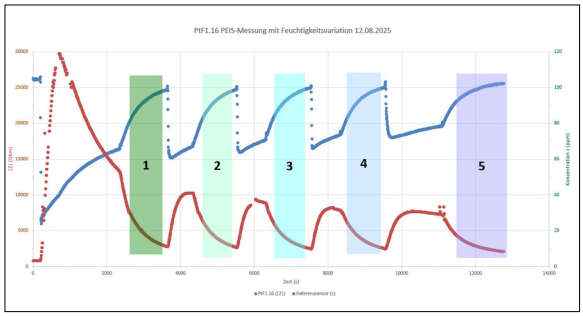
Definition of Task: The main goal of the work was to accurately measure the moisture inside a battery casing under real operating conditions. This was to help identify any weak spots in the casing and connection technology and show ways to improve them. In addition to high resolution in the range of a few ppm, the focus was on compact design, reproducibility of measurement results, and reliable integration of the sensor into the battery housing. Defining these requirements provided a clear basis for the design and evaluation of the prototype.

Result: The investigations show that the sensors are capable of reliably detecting moisture in the range from a few to hundreds of ppm. The resolution achieved is approximately 1 ppm, with both repeatability and reproducibility of the measurement series being confirmed. Calibration of the sensor is possible in principle, but needs to be further optimized in order to achieve a clear assignment of the measured values to exact ppm concentrations. Overall, the developed prototype meets the key requirements and forms a solid basis for future improvements in terms of accuracy, stability, and long-term behavior. The work thus makes an important contribution to the further development of miniaturized humidity sensors for applications in battery and medical technology.

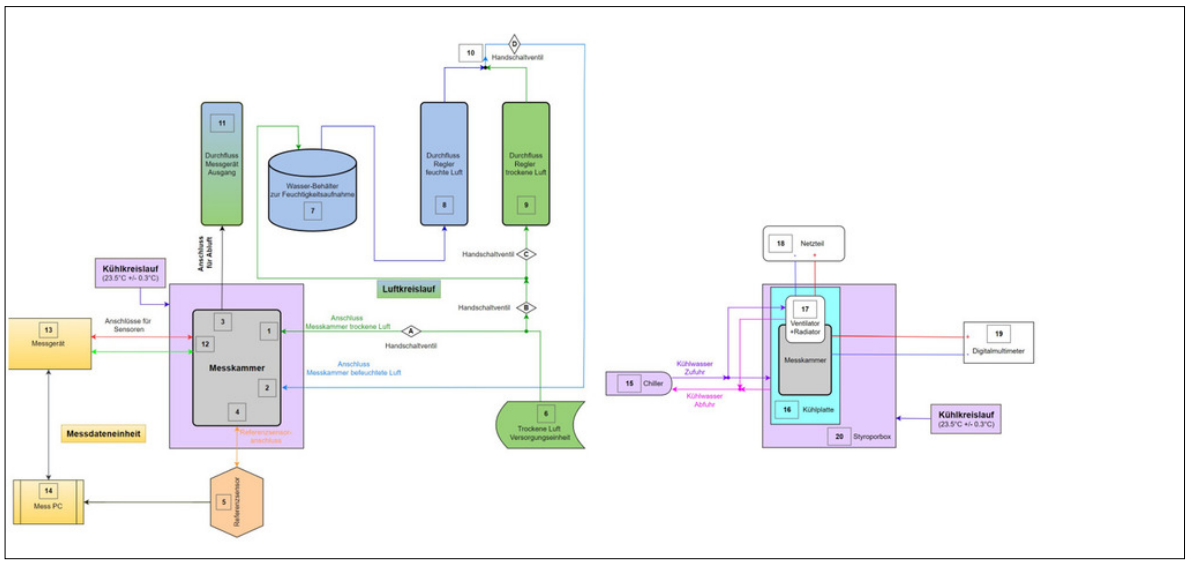
**Microscope image of the sensor with finger width of 50 µm and a gap of 30 µm**
Own presentment




**Dry–wet cycles, blue curve: developed sensor and red curve: reference sensor**
Own presentment




**Schematic overview of the laboratory setup**
Own presentment





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Subject Area
**Microtechnology**

Project Partner
**Wyon AG, Appenzell**
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