

## Sensors Used As Smart Noses

**New Generation of Sensors to Monitor Substances in Air and Water / Innovative Concepts to Save Resources and Detect Hazards / Industry and Research Found Association**

**When is the wine ripe? When do grains decay? Where are explosive gases formed? To control industrial goods and the living and working area of man, sensors are needed that are robust, autonomous, and available at low cost. Novel hybrid sensors measuring a large range of substances in air and water can help detect hazards and save resources. To foster the strategic development of hybrid sensors, Karlsruhe Institute of Technology and its partners have now founded an association.**

“Material flows in industry have to be controlled permanently in order to guarantee the quality of the products,” explains Hubert Keller, Section Head at KIT and chairman of the newly established association “HybridSensorNet”. “We want to network developers from industry and research, to develop viable sensor technologies, and to initiate long-term cooperation.”

Novel, so-called hybrid sensors can be applied in safety technology. Sensors in fertilizer stores can be used to control whether hazardous gas is formed by undesired decomposition processes. Sensors can also find toxic substances in drinking water. Fires are often preceded by a scorching cable that might have been detected much earlier by appropriate sensors measuring the plastic vapors. Sensors may also be applied for quality control of products subject to chemical or metabolic processes. Examples are the controlled fermentation of wine, the detection of decaying food in large stores or supply chains, or process control in chemical and food industry.

Hybrid sensors combine measurement and analysis in one system. Apart from the transducer proper, they are also equipped with computation capacity and algorithms to logically link measurement data and autonomously execute further evaluations. The sensor itself aggregates signals to information data.

“An example are nanostructured, coated measurement stripes that may attach to specific substances and, thus, cause a measurable variation of electric resistance,” Keller and Heinz Kohler from the Karlsruhe University of Applied Sciences explain. Kohler is the

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Deputy Chairman of “HybridSensorNet”. “If further data, such as pressure, temperature, or air humidity are considered in the evaluation, the substance can be determined very reliably and complex situations can be assessed.” At KIT, experts are working on signal processing, miniaturization, self-organization, and new principles of future hybrid sensors.

In the long term, the researchers plan to make hybrid sensors so small, robust, autonomous, and high-performing that they can be used in all areas of life without any large expenditure being required. “Connection to a smartphone will open up many potentials,” Keller said. “But it will certainly take several years until the ideas of science fiction authors will come true and we will measure substances in the breathing air of a patient and draw conclusions with respect to diseases and the state of health.”

The “HybridSensorNet” association is a network of all actors working on hybrid sensor technology and sensor networks for hazard recognition and resource efficiency. It follows the strategy of the successful BMWi Network “HybridSens”. “HybridSensorNet” is to open up the potentials of interdisciplinary applications, to demonstrate the relevance of sensors to safety and resource efficiency, to further define strategic objectives together with science, industry, and politics, and to establish appropriate framework conditions. To increase efficiency in practice, the association will form research and development clusters to organize the expertise of leading experts in various disciplines.

Founding members of the “HybridSensorNet” association established in March are;

AW-SYSTEMS GmbH, Wolfenbüttel; GED Gesellschaft für Elektronik und Design GmbH, Ruppichteroth-Winterscheid; Hochschule Karlsruhe - Technik und Wirtschaft, Karlsruhe; IL Metronic Sensortechnik GmbH, Illmenau-Unterpörlitz; Institut für Bioprozess- und Analysenmesstechnik e.V., Heilbad Heiligenstadt; Karlsruhe Institute of Technology, Karlsruhe; PATTERN EXPERT, Borsdorf; PTS-Prüftechnik GmbH, Waldstetten; STZ Sensorik und Informationssysteme - SensIn', Karlsruhe, and TecWi, Ellwangen.

For information on “HybridSensorNet” or registration as a member, interested researchers and companies are invited to directly contact Hubert B. Keller ([hubert.keller@kit.edu](mailto:hubert.keller@kit.edu)) or Wolfgang Berger ([info@tecwi.de](mailto:info@tecwi.de)).

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