Researchers achieve parallel measurement of multiple water parameters with single sensor chip

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Chip with two individual ISFETs, each in an n-well and bonded on a ceramic board. Credit: Fraunhofer IPMS

Ion-sensitive field-effect transistors (ISFETs) are compact, durable and
easy to integrate. This makes them ideal for precise pH measurement and the accurate determination of the concentration of many ions in water, thus making them powerful tools in environmental and bioanalytics. Due to their resistance to breakage, they are already widely used in pH measurement technology, especially in food production.

Fraunhofer Institute for Photonic Microsystems (IPMS) has now developed an n well technology that allows for the integration of several ISFETs on a single chip in such a way that they can be specifically functionalized with ion-selective layers.

This integration technology opens up the possibility of multifunctional ISFET arrays. In cooperation with research partners, further application-specific ion-selective coatings can be developed and integrated in the future. This enables the simultaneous and continuous measurement of different parameters such as pH, nitrate, phosphate and potassium concentration with only one sensor chip. Other parameters can be integrated into the system as needed.

"Such a measuring system, which can continuously record essential water
parameters in real time, has a huge market potential," says Dr. Olaf R. Hild, head of the business unit Chemical Sensor Technology at Fraunhofer IPMS.

"This opens up new possibilities for applications in environmental analysis, agriculture and water management, as well as in the rapidly growing market for indoor farming applications. And with this technology, we have a unique position in Europe."

The use of this technology should help to increase the efficiency and sustainability of agriculture by combining the measurements with external input, such as weather data. This would allow farmers to apply nutrients more precisely, resulting not only in savings on fertilizer costs, but also in the reduction of environmental impact.

Provided by Fraunhofer-Institut für Photonische Mikrosysteme (IPMS)


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