

Innovative Gas Sensor Technology Ensures Perfect Fruit and Vegetables

The “Deutsche Gesellschaft für Ernährung” (“German Society for Nutrition”) recommends eating 650 grams of fruit and vegetables daily. Even if every one of us consumes on average only about half this amount, this still means that around 2.8 million tonnes of fruit and 3.5 million tonnes of vegetables are sold per year in Germany. The fresh appearance of the goods is particularly important. At the “Leibniz-Institut für Agrartechnik” (“Leibniz Institute for Agricultural Technology”) in Potsdam, scientists are investigating, amongst other things, how packaging, storage and transportation can be optimised, to be able to offer consumers fruit and vegetables which are as fresh as possible.

“In order to achieve high accuracy and sensitivity, various precautions have to be taken in order to eliminate interference effects.”

The “Institut für Agrartechnik” in Potsdam, which belongs to the Leibniz community of independent research institutions, has as its principal task the “creation of the procedural basis for sustainable land management and the development of sustainable technologies for industry and agriculture.” The focal point in many areas is the efficient use of resources, while the developed solutions must both be profitable and must meet the requirements of environmental, animal and consumer protection.

In the Department of Technology in Horticulture of the Institute, scientists of various disciplines are working on the three closely linked areas of people, plant, and technology. The aim is to ensure the quality and the competitiveness of horticulture. Great research and development potentials exist especially in the area of the harvesting and the treatment of fruit and vegetables. Here, for example, investigations are being carried out on the influence of climate factors on fruit and vegetables after harvesting. Amongst other things, the exact behaviour of climacteric fruits is being investigated – i.e. fruits which continue to ripen after harvesting – under different environmental conditions.

The phytohormone ethylene, which has an autocatalysing effect, plays a central role in the case of climacteric fruits. The ripening fruit gives off ethylene, which in turn stimulates the ripening process of other fruits. This effect has been used since ancient times, by storing ripe and unripe fruits together. Bananas, which come mainly from South America and Asia, are harvested when green, then packed and transported in refrigerator ships, in order to interrupt the ripening process. After unloading, the bananas finish ripening in special banana ripening plants, where they are treated with ethylene. This ensures that the ripening process takes place evenly and all the bananas are ripe at the same time.

Investigations in the climatic chamber with gas monitoring

In relation to the ripening process and length of time for which bananas can be kept, we speak of green life and shelf life – which is the time for which bananas can be kept after the ripening process. After the bananas have been treated for 24 hours with ethylene at a concentration of 1,000 ppm, this is still five to seven days. The Potsdam scientists are conducting experiments in which different fruits are exposed to precisely controlled environmental conditions. “If different types of fruit and vegetables are transported and stored together, this can lead to rapid spoiling of the goods”, explains Manfred Linke, a senior scientist at the Institute. Ripe bananas or apples for example give off relatively high levels of ethylene, which in other fruits can then accelerate the ripening process, thereby resulting in a reduced shelf life.



In order to be able to conduct such investigations, a new trials system has been brought into operation at Potsdam. This was constructed by Plattenhardt + Wirth GmbH, specialists in refrigeration room construction, and consists of three walk-in cold rooms each with space for eight Controlled Atmosphere boxes (CA boxes). In these boxes, the composition of the important gases oxygen, carbon dioxide and ethylene can be set and controlled accurately.

In the various CA boxes, the concentrations of the above gases are measured regularly, in order to be able to adjust them accordingly. An important component of this technology is the gas sensor equipment, which must be able to determine the different gases exactly. There is however a need for improvement of the applied technology, as Manfred Linke knows: “The ethylene measurement in particular, is relatively imprecise at low concentrations in the range of a few ppm. It would be ideal if we could also carry out measurements down as far as the ppb range.”



Author Details:
Michael Maier
smartGAS Mikrosensorik GmbH
 Kreuzenstraße 98
 74076 Heilbronn
 Tel: +49 (0) 7131/797553-0
 Email: support@smartgas.eu

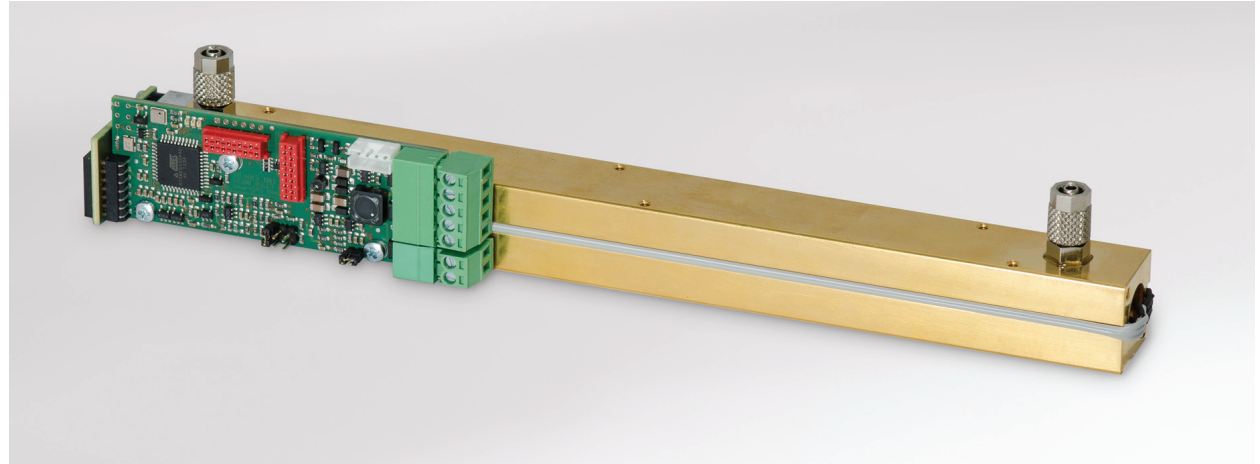
IR gas sensors offer many advantages

Gas sensors which are based on the method of infrared absorption (NDIR) are in principle able to determine gases very selectively. The method is based on the fact that for the detection of a certain type of gas, a specific wavelength in the infrared range is selected, at which absorption occurs. Ideally, this wavelength is selected so that other gases possibly occurring in the application show no absorption at this level. The concentration via the absorption can be determined very accurately by means of a comparison measurement with a known reference gas.

In order to achieve high accuracy and sensitivity, various precautions have to be taken in order to eliminate interference effects. These include, for example, the compensation of temperature or pressure fluctuations in the gas, which may have an influence on the absorption signal. smartGAS Mikrosensorik GmbH develops and produces extremely sophisticated NDIR gas sensors which are suitable for use in the climatic chambers. With the new sensor platform silarex (see box), this medium-sized company offers gas sensors which are not only very accurate, but also achieve their great accuracy at the lower end of the measurement range. In addition to sensors for CO, CO₂, SO₂ and NO, the company also supplies a sensor for the detection of ethylene.

More accurate gas sensors for research

Through the use of the gas sensors of the new silarex series, the "Institut für Agrartechnik" in Potsdam hopes to achieve a further improvement in the new trials system. "The more precise



determination of the ethylene concentration in the low range would be very important for us", as Manfred Linke summarises the hopes he places in the new sensor technology.

New gas sensor platform on infrared basis (NDIR)

smartGAS Mikrosensorik GmbH presented a new generation of gas sensors at Sensor+Test. The new silarex sensor platform works by the method of infrared absorption (NDIR), which leads amongst other things to extremely high selectivity. Cross-sensitivities to other gases are reduced to a minimum. In the new sensors, the developers of smartGAS have both integrated

pressure compensation and optimised the temperature compensation. This significantly improves the accuracy and linearity; the lower noise level of the electronics also greatly reduces the detection limit of various gases. With these new sensors, which are first available for the gases SF₆, CO, SO₂ and ethylene, the reliable and long-lasting NDIR technology can be applied in areas that were not previously possible. The silarex platform opens up new application areas for the user which were previously not accessible with NDIR sensors, such as the monitoring of fruit storage facilities (ethylene), in emission technology (CO, SO₂) and for tracer gas monitoring (SF₆).

Read, Print, Share or Comment on this Article at: Envirotech-Online.com/Articles

