Fraunhofer IPM

Press Release

Energy-autonomous sensors in logistics: continuous control of perishable goods

For over 20 years, Fraunhofer IPM has been researching in the field of gas and fluid measurement techniques. Semiconductor sensors, spectrometers as well as components from the Institute are used in the automobile industry, environmental analysis, building technology, safety technology or medicine technology – tailored, robust and energy-efficient. Current developments in gas sensors and thermoelectrics can be found on the Sensor+Test 2010 in Hall 12, stand 202.

The safety and quality in the food supply of today's globally organized and networked supply chain is everything else than warranted. More than 50% of all foodstuffs are spoiled in the transport routes; alone in Great Britain this makes up 17 million tons and approximately 20 billion Euros. Intelligent measurement techniques – specifically applied – can sustainably save energy resources. Inside the Fraunhofer »Food Chain Management« Alliance, Fraunhofer IPM is developing different measurement systems for the online monitoring of foodstuffs. The use of gas chromatography in connection with metal oxide semiconductor sensors permits economical online control of processes in the food industry. A combination of gas chromatography and an optical ethylene measurement system monitors the quality of foodstuffs and safety for fruit, vegetables and also fresh meat. In a banana storage unit or container, the climatic technology can be efficiently controlled on the basis of the determination of the ethylene concentration, and this also applies to greenhouses.

Economic control of the transport routes of perishable goods

Since the start of last year, in collaboration with European partners in the »RFID Pro-Active Cold Chain« project, the Fraunhofer IPM has been developing UHF-RFID tags with integrated sensoring in order to seamlessly document the transport routes of perishable goods such as medications, especially vaccines or foodstuffs. Moisture sensors also prevent rusted steering axes and help to save time and energy in this way. Temperature sensors are meant to sense the surroundings quickly and without contact, and thus control the climate technology in an as energy-efficient manner as possible. For instance, they raise the alarm as soon as the cooling chain is interrupted.

Clean air: Imission monitoring

Fraunhofer IPM is also active in imission monitoring. Besides optical systems for determining methane, the gas measurement system includes electrochemical elements for detecting ozone and CO; as well as semiconductor sensors, and temperature and moisture sensors. The aim is to create a mobile dynamic environmental cadastre for recognizing pollutant concentrations and counteracting them. With the aid of this complete measurement system, an important contribution is made towards achieving climatic protection goals and implementing the Air Pollution Regulation.

At the Sensor+Test 2010, Fraunhofer IPM is exhibiting sensing RFIDs, compact gas measurement systems, e.g. for ethylene, or gas sensor arrays for detection of gases and gas mixtures, as well as a gas-sensitive metal-oxide thin-film transistor. Interested parties can also inform themselves on measurement systems: a light source for infrared spectroscopy, multi-reflection cells and fast modulating IR emitters for the 5 µm to 12 µm wavelength range.

Future technology thermoelectrics: energy-autonomous systems use waste heat.

More than 60% of the overall used fossil primary energy is wasted as unused heat energy according to a study of the Lawrence Livermore National Laboratory. Thermoelectric generators are able to utilize the energy portion of lost heat – at least partially – for instance, in firing plants in industrial processes, and especially in the automobile, and convert it into electric current. That this works is shown in thermoelectric generators in space where they have been used for decades as extremely reliable suppliers of energy for probes and satellites – emission-free, silent and vibration-free. Fraunhofer IPM is demonstrating this with a Carrera track, at which visitors can take part in car races. The model racers are powered by thermoelectric generators of bismuth or lead telluride. Moreover, energy-autonomous radio sensors use waste heat and thus cover many applications. In the car they can help to save weight as heavy cables are superfluous. The sensors also aid with monitoring old buildings. They can simply be stuck to the walls where, for example, they measure the moisture. They are even applicable in the field of medicine. In this way, sportspersons can measure their pulse via a sensor system built into their T-shirts, or use hearing aids which obtain their power from body heat.

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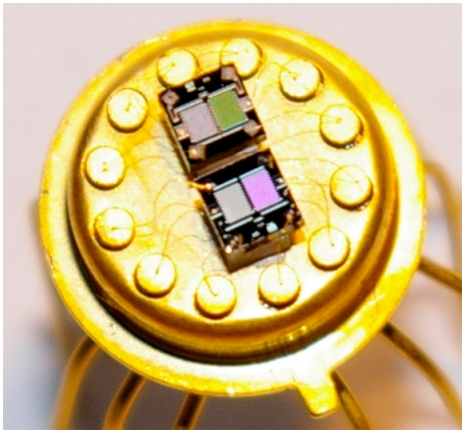

Picture caption: A gas sensor array developed by Fraunhofer IPM with four effective layers: SnO_2, SnO_2/Pt, WO_3 and CTO. The dimensions of the sensor array are (1.5 x 1.5) mm². (© Fraunhofer IPM)

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The Fraunhofer Institute for Physical Measurement Techniques IPM has many years of experience in optical 2D and 3D Imaging Techniques. Fraunhofer IPM develops and builds optical sensor and imaging systems. These mostly laser-based systems combine optical, mechanical, electronic and software components to create perfect solutions of robust design that are individually tailored to suit the conditions at the site of deployment. In the field of thermoelectrics, the Institute has extensive know-how in materials research, simulation and systems. Fraunhofer IPM also specializes in thin-film technologies for application in the production of materials, manufacturing processes and systems. Yet another field of activity focuses on semi-conductor gas sensors. Further information: www.ipm.fraunhofer.de

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