

# sensor *report*

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[www.sensorreport.de](http://www.sensorreport.de)

Sensors

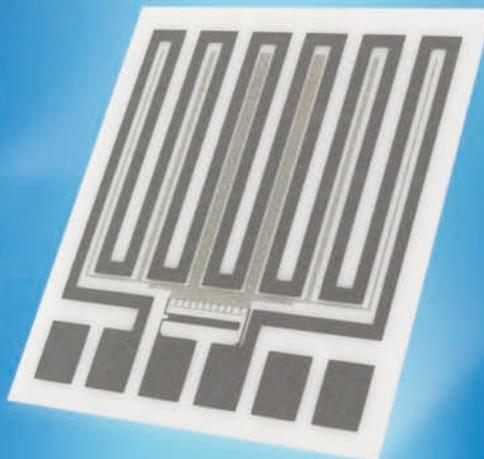
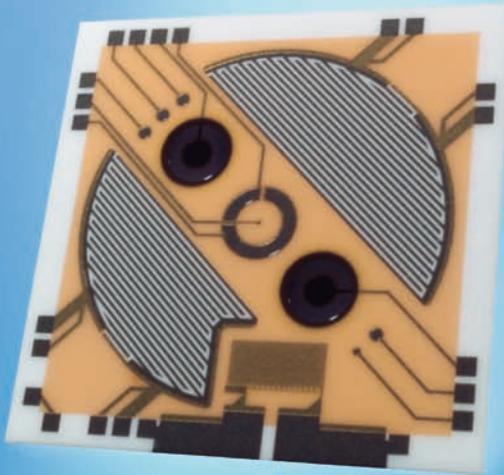
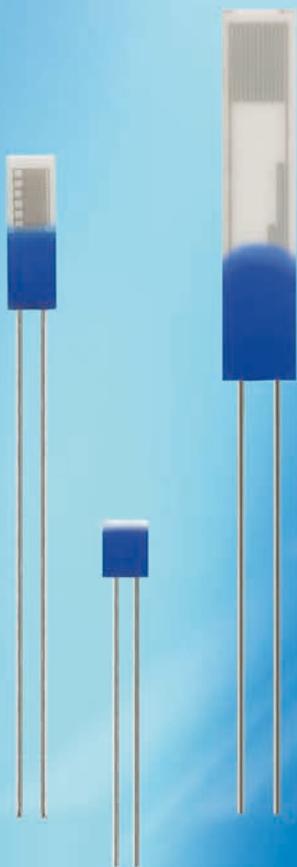
Measurement  
Technique

Industrial Vision

Factory Automation

## Heraeus

World class sensors based on innovative materials  
and microstructure technology.



### ***SENSORS***

- CMOS imagers for new applications
- Sensing and signal conditioning at 250 °C
- Low power modes embedded
- Microelectronics and packaging technology

### ***MERSURING AND TESTING***

- The need for controlled shocks
- Near-Infrared cameras

### ***APPLICATIONS & PRODUCTS***

- The high score is four
- Wireless Sensor Networks

### ***WDM - PROCESS INSTRUMENTATION***

- New sensor concepts for effluent treatment

### ***PANORAMA***

- Sensor+Test 2010
- Events – News – Books

Official media partner

**AMA**  
Fachverband für Sensorik e.V.

# Beyond Temperature Sensors

Sensor Components Division grows into new markets

For years now Heraeus Sensor Technology a division of W.C. Heraeus has been a technology and market leader in the broad field of high quality temperature sensors. Manufactured in platinum thin-film technology, several tens of millions of sensors leave the factory in Germany's Kleinostheim each year. They are destined for continuous use in process technology, in exhaust systems, ovens, buildings or also in calibration laboratories. The accumulated knowledge and expertise, as well as the setting up of production plants, are now returning extremely positive initial experience in new fields of application. We were able to learn about this early experience from the Division Manager and General Manager of Heraeus Sensor Technology Dr. Martin Turwitt and the Director for Marketing & Sales, Dr. Gerold Kerkhoff.

Which properties make platinum such an extraordinary material?

**TURWITT.** We basically exploit two of the special properties of platinum. One is the almost linear characteristic of the temperature dependence of conductivity which makes platinum the ideal material for resistance temperature sensors. The second reason is that platinum really earns its classification as a noble metal. It is particularly inert in reactions or, to put it positively, it is resistive to corrosion with other materials.

**KERKHOFF.** We have special expertise in the use of platinum as a sensor – correctly packaged – for applications in the high temperature range up to 1,100°C. This is where one of our strengths lies, for example with the use of our temperature sensors or flow sensors in exhaust systems.

We have used the property of its inertness as a noble metal for a long time now, particularly in biosensors, where it is important that no chemical reaction whatsoever occurs between the sensor and any substances.

How did you come from the passive layers of temperature sensors to the active layers of heaters and therefore to sensors for gases and mass flow rate?

**TURWITT.** The measurement principle of the anemometer is now very old, but formerly thin films were not used. And then came the requirement from the automotive industry to measure the mass air flow rate for optimising the combustion. Here, we were able to apply our expertise in thin-film technology and enter very decisively with a solution. Today this task is carried out by a silicon component. It does not function however in the high temperatures of the exhaust system, so that we were able to offer a solution with our platinum technology.

Where do you see the opportunities of employing platinum films other than in temperature and flow?

**TURWITT.** Thin films are, of course, very widely used. You will also find our platinum films in biosensors, for example. This ena-



In discussion at Heraeus Sensor Technology (from the left) General Manager Dr. Martin Turwitt, SR Chief Editor Dr. Gerhard Weissler and Dr. Gerold Kerkhoff, Director for Marketing & Sales: «Especially interesting for us are products matching our product spectrum which have been developed by industrial companies together with research establishments....»

bles, say, cell growth under the influence of various medicaments to be observed. Or water quality can be monitored via the degree of algae formation. Projects are running in co-operation with the University of Munich in this respect.

The sensors involve not only the deposition of the platinum, but also thin films of other metals and oxides. Here, we are moving away from the field of platinum films and are working with completely different materials – but still in the form of thin films. Where required, these can also be magnetic, optical or gas-sensitive films. Of course, our processes extend still further. Here, they cover the micro-structuring of these films, protective coatings and contacting.

Does this mean that in future you will also be able to establish thin-film processes which are not based on platinum?

**TURWITT.** Exactly. They can be other metals or oxides – including ceramic thin films. We modify the initial materials to manu-

facture products other than temperature and flow sensors in large quantities using our process experience and our machines. We certainly have the appropriate specialists for this.

**KERKHOFF.** We are increasingly making use of the combination of our technological possibilities and our special material expertise to go beyond temperature sensors. Through the integration of micro-heaters and high-temperature stability sensor structures on one chip we are developing and producing customised solutions for tasks in gas and particle sensors. In our biosensors we are already now integrating oxygen and pH sensors which are not manufactured in platinum.

So far we have been talking about substrates of aluminium oxide. Along with other thin-film materials, do other substrates also play a role?

**TURWITT.** The most obvious are of course other oxides, such as zircon oxide, which almost behaves the same in a vacuum, that is, it does not evolve gases nor evaporate. Various types of glass are of special interest for biological chips. Here, it is often necessary to carry out supplementary observations with an optical microscope, so transparent materials are needed. We are supplying all this already.

**KERKHOFF.** When a customer comes to us with a concrete product design and specifies the substrate and coating materials, then we develop the appropriate process. Usually though, the customer has a sensor problem and is seeking a company that will make a suitable selection of materials and develop a functioning layout for the sensor structure. Between the conflicting priorities of product requirements, product manufacturing feasibility and economic efficiency, we develop a solution for customers based on the most suitable combination of materials. Often we are included in a development project if it entails the transfer of research products into large scale production. In this respect we have not only our own laboratories at our disposal, but we also have access to extensive expertise in metals, in quartz glass or ceramics within the Heraeus Group. For almost all technically relevant materials we have specialists within the group who are available.

What happens in the further processing of the coated components?

**TURWITT.** Normally, our products start in clean rooms with cleaning and coating processes and finish with screen printing

processes, for example for the protection of thin films by glass or for the manufacture of, for example, conductor or contact tracks with the relevant subsequent oven processes. This all means that we have also accumulated lots of expertise in the field of thick films. Usually, the combination of thin and thick films produces the desired solution.

After that first comes the contacting. For temperatures up to about 600°C we use thermobonding, but we also have various welding and brazing methods for higher temperatures. Then, as applicable, mechanical processing steps follow, such as welding or sawing and other assembly steps. Finally, we can manufacture products which are completely encased. However, this is not our primary objective. We want to manufacture sensor elements or semi-fabricated sensors which are then processed further by our customers.

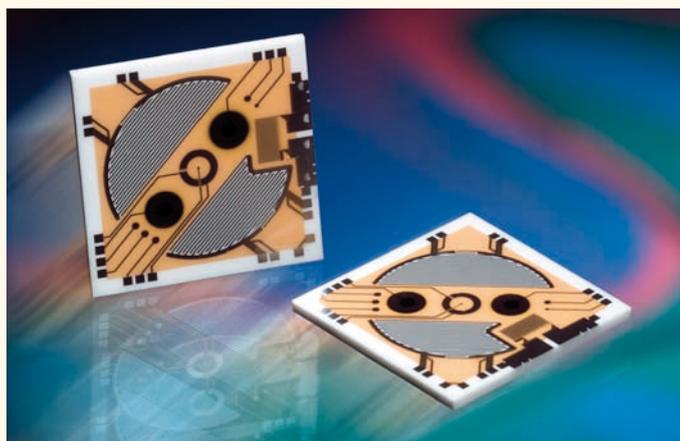
Going beyond production, what fields of competence can Heraeus Sensor Technology offer?

**TURWITT.** We are certainly keen to take up general enquiries from customers in the direction of technology, market situation or portfolio, etc. and elaborate on them. Here, it may also transpire that it is better, for example, to first make contact with an institute to clarify certain steps. We also undertake one or the other basic research project if it is evident that at the end of the day it might lead to the large-scale production of a component.

**KERKHOFF.** Often these are projects which involve product feasibility. We particularly see ourselves at the interface between basic research and large-scale production. That is often a long path. Especially interesting for us are products matching our product spectrum which have been developed by industrial companies together with research establishments. When the question arises after the development phase: Who can now produce for the market? Then with our facilities, we are the right company to contact for developing large-scale production processes – through to the inspection specifications for the customer's end product and the appropriate training. [L103106](#)

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**AUTHOR.** The questions were put by the Chief Editor, Dr. Gerhard Weissler.



#### ABSTRACT

Seit Jahren gehört Heraeus Sensor Technology zu den Technologie- und Marktführern im weiten Feld der hochwertigen Temperatursensorik, hergestellt in Platin-Dünnschichttechnik. Das Unternehmen bietet jetzt kundenspezifische Lösungen für mikrostrukturierte Dünnschicht- oder Dickschicht-Systeme. Der Produktbereich erstreckt sich von hochtemperaturstabilen resistiven oder kapazitiven Sensoren über Mikroheizer bis zu Multisensorlösungen für Anwendungen in den Lebenswissenschaften, der Bio- und Gassensorik. Besonderes Interesse gilt der Überführung von Prototypen in die Serienfertigung. [gaw]