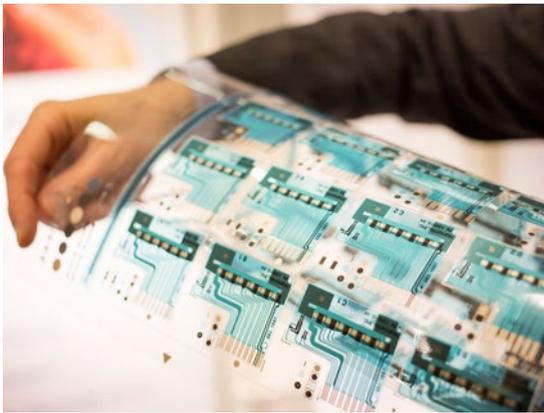


Insights

PRINTED ELECTRONICS - MOVING AHEAD



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Sensors, batteries and circuitry can be printed directly on films. The OE-A (Organic and Printed Electronics Association) is bringing industry representatives, material manufacturers and researchers together to turn ideas into products. This is how displays become flexible and packaging starts to interact.

By Stefanie Nowak

“Attention! Temperature increase! The current temperature of batch DE-286023 is 9 degrees.” At the click of a button, this notification informs the pharmaceutical manufacturer of the location of the goods - in storage room 14.b

in a logistics center some 200 kilometers away. They can then initiate measures to regulate the room temperature.

The alarm itself was raised by a temperature label attached to a pallet of pharmaceuticals. The label consists of a temperature sensor, a circuit, data storage, an antenna, a NFC module for wireless data transmission, a battery and, of course, film and adhesive. “These labels cost around 10 euros today because they are made up of conventional electronic components,” says Dr. Klaus Hecker, Managing Director of the OE-A. “With printed electronics, the price will be around 1 euro in the future, and the labels will not only be used for entire batches, but for individual packages as well.”

Rapidly growing market

“The organic and printed electronics market is worth billions - and the future looks set for growth,” says Hecker. Labels that make it possible to verify whether the cold chain has been consistently complied with are only one example of the opportunities unlocked by printed electronics. OLED displays (organic light-emitting diode) are just as much a part of the product range as electronic seals, flexible displays, packaging with glowing labels and products of medical technology. Market research institutes expect the market volume to increase to 27 billion US dollars in 2017.

“Experts predict that the market will double in size in the next five years,” states Dr. Hecker. Additionally, the Internet of Things will give rise to a wealth of other possible applications in the years to come, as this requires a wide range of compact and cost-efficient sensors that can be integrated seamlessly into existing systems. “Printed electronics with sensors that can measure pressure, temperature, humidity, movement and wear are a great solution here. They are increasingly being used in wearables, i.e. wearable electronic devices used in the fitness and medical sector - which is, incidentally, another market with rapid growth,” explains Hecker.

Printing sensors layer by layer

But how can you print a battery or a sensor? “Printed Electronics starts usually from plastic films or specialty papers,” explains the VDMA expert. These substrates are then coated or printed with multiple, extremely thin layers of conductive polymers, silver inks or pastes. This is done in modified printing processes such as inkjet, screen and gravure printing. The result is resistors, sensors, conductors, luminous surfaces and many other technologies. “Although this may sound simple, all the processes need to be aligned very carefully. Excellent collaboration between experts from the fields of chemistry, printing, and electronics is very important in this regard.”

Bridging the gap between R&D and industry

Headed by Dr. Hecker, the OE-A was founded in 2004 as a working group within VDMA and has organizational ties to the Electronics, Micro and Nano Technologies (EMINT) Association. The OE-A has a strong international focus from its very beginning - the now well over 200 member companies are based in Europe, Asia and North America. "The goal of the OE-A is to bridge the gap between research and development and the consumer industry," says Hecker. "Ranging from mechanical engineering companies to material manufacturers, producers, end users and research institutes, our member companies span the entire production chain."

The organic and printed electronics industry is currently still in the development stage, with many products still being researched. "We are supporting the companies in establishing this industry," stresses Hecker. To ensure that the products make their way from the lab to the mass market, the OE-A network encourages dialog between all stakeholders involved in the process.

Printed electronics in everyday life

Organic and printed electronics have already become established in many applications, such as cars. For example, the touch screens in the center console and automatically dimming rear-view mirrors are produced in printing processes - and the same goes for seat occupancy sensors for measuring weights. In the case of an accident, these sensors communicate with the airbag and relay information on which seats are occupied. OLED rear lights are another example of printed electronics that have now become a standard in many models.

In medical technology, people with diabetes have been using test strips with printed sensors for measuring their blood sugar level for quite some time now. And the electrodes used in ECG measurements are also produced in printing processes in many cases. "Combined with flexible batteries, NFC modules and displays, these sensors are paving the way for a vast array of new products and fields of application in the health and fitness sector," confirms Hecker.

Increasing production volumes

When it comes to the challenges the industry is facing, Hecker is clear about which aspect takes priority. "The cost factor is of central importance in this context. We need to increase production volumes in many areas in order to make the products profitable." And investors are a fundamental prerequisite for turning ideas into competitive products, he continues. Further important aspects are to print ever smaller and more precise products and to focus on further improving the materials. For the members of the OE-A, environmental aspects and the protection of resources are also gaining relevance. "Our Sustainability working group explores regulatory frameworks as well as recyclability and sustainability aspects," says Hecker.

Where is the industry headed?

"Further development in this field is basically unstoppable, and one of the major trends is stretchable electronics," Dr. Klaus Hecker says with conviction. "Stretchable electronics will increasingly make their way into medical technology and the textile industry in the next years. They can be worn just like a second skin," he continues.

The OE-A's most important publication is its Roadmap, which is published every two years. In the OE-A Roadmap, experts explain which applications are already possible today, provide details on state-of-the-art technology and highlight important challenges and goals. "Geared towards industry representatives, policymakers and researchers, the OE-A Roadmap provides a comprehensive outlook on the future of the sector," says Hecker. "In addition, it supports companies in planning their developments and products," he adds. The new white paper of the 7th edition of the OE-A Roadmap was published in September 2017.

10th anniversary of the LOPEC trade show

LOPEC (Large-area, Organic & Printed Electronics Convention) is the world's leading trade show and conference for the organic and printed electronics industry, organized by the OE-A and Messe München. Companies and experts from the entire value chain participate in LOPEC to present innovative technologies, new products and business models. The tenth LOPEC will be held in March 2018. ■

Further Information

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