Hessian Ministry of Economics, Transport,
Urban and Regional Development

www.hessen-nanotech.de

HESSEN

Hessen-Nanotech NEWS

An Invitation from Hessen-Nanotech

New Guideline: Nanotech Cooperations

Organic and Printed Electronics
- Innovative Applications on Large Area
- High Performance Materials for a New Generation of Electronics
- International Network OE-A
- LOPE-C – International Industry Summit

Special Edition
for the LOPE-C Convention

Hessen – there´s no way around us.

2 | 2009
April

Hessen Nanotech

Dear Hessen-Nanotech NEWS Reader,

Editorial

We will soon be able to print electronic components on a large scale. Printed photovoltaic cells for providing mobile computers with power are already available on the market today. Manufacturers are currently developing methods to increase efficiency and durability of these photovoltaic mini power plants, so that they can soon be put to use on roofs and building facades. Photovoltaics could take a major step toward cost-effectiveness through affordable production of printed solar cells.

However, the possibilities of printable electronics offer various other perspectives as well: In the future, flexible luminescent wallpaper made of organic light-emitting diodes (OLED) will provide offices and living space with light and color, or will present moving images on energy-saving, large-format, paper-thin displays.

Additionally, "printing" electronic elements will play an important role in promoting the spread of Radio Frequency Identification (RFID), as it promises to make the production of complex RFID labels affordable. This improvement will not only simplify mass logistics in merchandizing, but will also upgrade product safety and trademark protection. Within this context, intelligent packaging and disposable diagnostic devices for medical technology are further examples of applications for printed electronics.

The German State of Hessen plays a significant role in the development of technologies and applications. Innovative companies such as Merck and academic institutes such as the Technical University of Darmstadt are leaders in research. The "Organic Electronics Association (OE-A)", as the leading international industry association, must also be commended for its world-wide coordination of developments from its headquarter in Frankfurt. The OE-A, in cooperation with Messe Frankfurt Ausstellungen GmbH (MFA) invites you to this world summit for the field of organic and printed electronics in Frankfurt, Germany from June 23-25, 2009. With the LOPE-C 2009 – Large-area, Organic & Printed Electronics Convention a significant part of our future will be debuting in Hessen.

Dieter Posch
Hessian Minister of Economics, Transport, Urban and Regional Development

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Technology and Company News

Analysis and Testing Provider Aqura Implements New High-Resolution Microscope

Aqura GmbH, located in Hanau's industrial park IP Wolfgang, supports research on nano materials with a new field emission scanning microscope. This microscope is the most efficient of its kind and "delivers extreme magnifications in a quality unknown to date", as Dr. Harald Mueller of Aqura explains. It reveals to researchers unique insights into the most minute particles. Since March the tool has been available to customers with commissioned measuring assignments within and outside of the industrial park.

■ www.aqura.de

First Use of Printed Radio Chips Realized in Public Field Tests

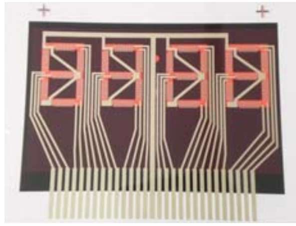
Within the framework of the BMBF-funded project PRISMA – 'Printed Smart Labels', printed radio chips, produced from polymer circuits on thin, flexible polyester foil, have been tested for the first time in various everyday situations in the areas of electronic ticketing and security. For this, the project partners – PolyIC, Leonhard Kurz Stiftung & Co. KG, Siemens AG, Bundesdruckerei GmbH, Höft & Wessel AG, Bartsch GmbH and TU München – realized complete systems. This initially incorporates RFID (Radio Frequency Identification) tags, i.e. printed chips including antennae that transmit at a standard frequency of 13.56 MHz.

In PRISMA, these systems were tested for the first time anywhere in the world in public field test scenarios in real applications. See this application in real life at LOPE-C 2009 at the booth of PolyIC.

■ www.polyic.com

TU Darmstadt with New Research Focus "Printed Electronics"

The "Institut für Druckmaschinen und Druckverfahren – IDD", (institute for printing science and technology) at the Technical University of Darmstadt will expand its research group "Functional Printing" to 20 researchers. The program is funded within the scope of the "Spitzencluster Forum Organic Electronics" of the Rhine-Neckar metropolitan region which is promoted by the BMBF (German Federal Ministry of Education and Research). The project's goal is the development of innovative printing technologies for smart labels, displays and OLEDs. The scientific approach of a process model for printed electronics is new. Cluster partners are Merck, BASF, SAP, Bosch, Heidelberger Druckmaschinen and PolyIC, among others.



Functional Printing requires new printing technologies. It is not enough, for example, to apply a printed conductor path to a surface. The path must be uninterrupted to be electrically conductive. (Source: Technical University of Darmstadt)

■ www.idd.tu-darmstadt.de

nanoTruck Makes Stopover in Hanau and Fulda during Germany Tour

170 school students used the nanoTruck stopover in Hanau to participate in a scientifically-guided tour. Some were able to experience nano technology in practice by attending a nano-experiment course. (Source: Flad & Flad Communication)

From February 2-3 in Hanau and February 4-5 in Fulda, approximately 1 600 school students and interested citizens took part in a journey by nanoTruck to the nano universe. During the four-day trip researchers accompanying the roadshow vehicle reported meeting "surprisingly well-informed citizens" who had questions ranging from property changes on the nanoscale to risk aspects. The nanoTruck will make its next stopover in Hessen in Marburg on June 9, 2009. Would you like to have the new nanoTruck visit you? Schools, universities, institutes or businesses can apply free of charge for a stopover by the nanoTruck.

■ www.nanotruck.de

An Invitation from Hessen-Nanotech

Topic in Focus

Hessen-Nanotech brings providers and end-users together.

Many leading high-tech trade shows and conventions take place regularly at Messe Frankfurt, Germany. During the first half of 2009 the initiative "Aktionslinie Hessen-Nanotech" will present nanotechnologies in Hessen in information booths at three of these events. Join us from **May 11-15** at the **ACHEMA** in the foyer of hall 4.1, from **June 16-18** at the **Material Vision und TechTextil** (hall 4.1, booth J23) and from **June 23-25** at the **LOPE-C Large-area, Organic & Printed Electronics Convention** (Congress Center, booth H39). We would be pleased to offer you an initial consultation on possible nanotechnology applications for your company, or to assist you in finding nanotech providers in Hessen. Speak to us about opportunities for Hessian innovation funding. We will help you on business issues and in finding relevant contacts in Hessen.

The initiative Hessen-Nanotech is also planning the **6th Nanotechnology Forum Hessen** at the Congress Park in Hanau on **November 26, 2009**. The focus of this year's annual conference with an accompanying exhibition will be on the topics of nano chemical, pharmaceutical, medical and dental technology. Hessen-Nanotech will soon be issuing a Call for Papers. However, you can already request core themes for workshops, presentations and poster sessions per e-mail from info@hessen-nanotech.de and reserve an option to exhibit.

■ www.hessen-nanotech.de/veranstaltungen

Cooperations Expedite Successful Implementation of Nanotechnologies

Literature

"Particularly in economically tense times, future-oriented companies promote innovations, in order to later get off to a good start with new products", said Dieter Posch, Hessian Minister of Economics on March 6 at the introduction of the new guidelines "Nanotech-Cooperations – Successful – Cooperations for Small and Medium Nanotechnology Businesses" from the Aktionslinie Hessen-Nanotech series. The brochure should provide assistance to providers as well as users of nanotechnology in successful planning, preparing and realizing cooperations. The minister further explains that it is the diversity of the players and topics in particular that make cooperations in the field of nanotechnology not only necessary, but also promising. Therefore, in order to take advantage of the opportunities of nanotechnology, interested companies should cooperate more with competent partners from universities and industry. The "Aktionslinie Hessen-Nanotech" will be happy to support Hessian businesses in their search for appropriate partners.

The brochure, which offers practical advice on business cooperations, can be obtained free of charge in printed and electronic form (only available in German) at:

■ www.hessen-nanotech.de/veroeffentlichungen

Organic and Printed Electronics – Innovative Applications on Large Areas

In the future vehicles could have transparent white organic light-emitting diodes (OLEDs) as panel displays. (Source: Fraunhofer IPMS)

Planet Earth is not lacking energy. After all, the sun sends more energy to us within 30 minutes than the Earth's total population can use in one year. So far, however, only a small amount of that energy is used world-wide, as conventional solar modules made of silicon are comparatively expensive to produce at approximately two Euros per watt peak. Organic photovoltaic cells are expected to lead to considerable savings.

"In a few years, organic photovoltaics will potentially be produced at costs of less than 50 Euro Cents per watt peak", says Christoph Brabec, Chief Technology Officer at US-based Konarka Technologies, Inc. "That would make organic photovoltaics much less expensive than comparable technologies."

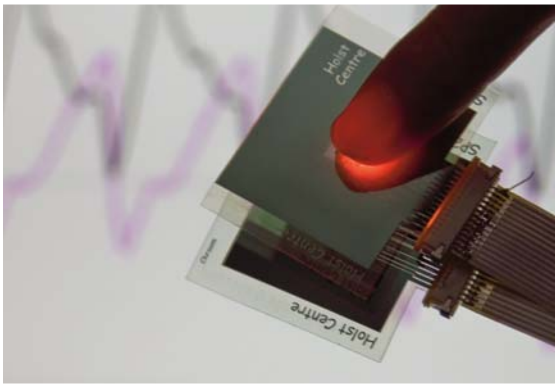
RFID labels will be mass-produced with cost-effective printing technologies. (Source: PolyIC)

This will be made possible through organic and printed electronics, for example by printing liquid-soluble plastics onto lightweight and flexible substrates. Depending upon their chemical composition these "functional polymers" offer insulating, semi-conductive or conductive properties and therefore enable the extremely cost-effective production of electronic components such as transistors, light-emitting diodes or photovoltaic cells in continuous printing processes (e.g. offset, screen or inkjet printing).

Printed Organic Electronics Open New Spectrum of Applications

Organic and printed electronics offer a completely new spectrum of applications reaching beyond organic photovoltaic cells and complementing conventional silicon technology. They are, for example, suitable for the production of printed transistors which can be used as Radio Frequency Identification (RFID) labels in merchandise logistics, and organic light-emitting diodes (OLED) used for television displays or flexible, luminescent wall paper. Furthermore, optical data storage, flexible batteries and disposable measuring devices can be used in clinical diagnostics as well as many other innovative electronic applications.

Experts forecast that the market for organic and printed electronics will develop at a breathtaking pace in the next years. According to the market research institute Nanomarkets products worth 1.4 billion US Dollars were sold internationally in 2007. By 2014 turnover should increase to more than 30 billion US Dollars.



Blood oxygen content will be measured with sensor films that combine light sources and photo sensors on a small surface. (Source: Holst Centre)

Promoted by the Hightech-Strategy of the German government, "Spitzencluster Organic Electronics" will play an important role in technology development. Merck KGaA and the Technical University of Darmstadt represent the German state of Hessen as participants in this research cooperation.

Merck KGaA - High Performance Materials for a New Generation of Organic Electronics

www.merck.de

Merck aims to be a strong partner to the OE business with a pioneering spirit and expertise derived from many years of experience in development, scale up and production of advanced materials for high-tech applications in the opto-electronic industry. From our state-of-the-art R&D centres in Darmstadt, Frankfurt and Chilworth, UK, through to large scale manufacturing facilities, we have a global supply chain and infrastructure with the capability to provide high performance semiconducting materials in ready-to-use, easily processable formulations. Merck is currently striving to enable the commercialisation of organic electronics applications like organic light emitting diodes (OLED), organic field effect transistors (OFET) and photovoltaic cells (OPV) through the development and supply of ready-to-use semiconducting inks and ancillary materials.

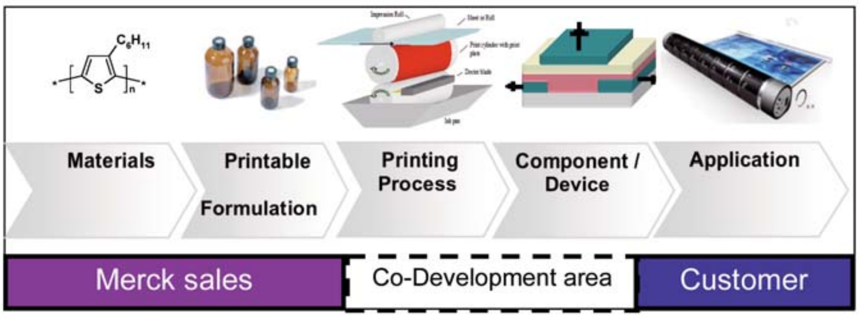
A primary motivation for organic electronics is the appeal of the potentially low cost solution based fabrication process, and freedom of size, form factor and application architecture. Additive printing processes such as ink-jet or flexographic can be utilised to deposit a sequence of organic layers, ultimately leading to a highly integrated stack of active components.
Depending on application area, the provided ink has to combine performance features for the electronic device with rheological requirements for the selected printing method.

The lateral feature sizes of the printed layers range from wide area coatings as in photovoltaics and OLED lighting to pixelated arrays in high resolution organic transistor backplanes and OLED frontplanes with layer thicknesses in 50 nanometer scale. In addition, customers request ambient printing conditions and standard printing equipment to be utilised.

Merck invested heavily in recent years in our dedicated research laboratories in Darmstadt, Frankfurt and Chilworth, UK, encompassing synthetic chemistry labs, device preparation and electrical (-optical) characterisation with ink formulation and printing capabilities.

In 2006, the Chilworth site established a meanwhile highly recognised printing platform which enables Merck to provide the industry with highly sophisticated and customised semiconductor inks.

Most recently, Merck announced the extension of the facilities in Chilworth and the investment in a new R&D center in Darmstadt to expand material development and device fabrication for organic photovoltaics and OLED.



Merck focuses on development of materials and customised formulations and supports customers in applications

Merck KGaA
www.merck.de

OE-A – International Network for Organic and Printed Electronics

Clusters and Networks

The Organic Electronics Association (OE-A), a working group within the German Engineering Federation (VDMA), was founded in December 2004. The OE-A is the key international industry association for organic and printed electronics and represents the whole value chain of this emerging industry. Its members are leading international companies and R&D institutes, component manufacturers and material suppliers, equipment and tool producers as well as end-users. More than 120 companies from Europe, North America and Asia are working together within the OE-A to promote the establishment of a competitive production infrastructure for organic and printed electronics. With this goal in mind, the OE-A organizes working groups on the subjects of applications, technology, quality control, demonstrators, as well as education and further training. The OE-A regularly issues an applications and technology roadmap for organic and printed electronics to provide companies, institutes, investors and public authorities with planning guidelines for entrance into this emerging industry. OE-A's vision is to build a bridge between science, technology and applications. The VDMA is the largest industry association in Europe with its more than 3000 member companies from the industrial goods industry.

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oe-a Organic Electronics Association

www.oe-a.org

LOPE-C – International Summit on Organic and Printed Electronics

Announcement

The LOPE-C 2009 – Large-area, Organic & Printed Electronics Convention will take place at the Congress Center of Messe Frankfurt from June 23-25, 2009 as the leading international conference and exhibition for this emerging industry. LOPE-C is organized by the OE-A (Organic Electronics Association) in cooperation with Messe Frankfurt Ausstellungen GmbH (MFA).

With more than 100 presentations and 50 exhibitors, LOPE-C will be the largest event for the organic and printed electronics industry. More than 600 participants worldwide are expected to attend.

Leading representatives from industry and academia will introduce the latest applications and developments. With its numerous world premieres LOPE-C emphasizes its position as the main event of the field. A business conference, seminars and poster sessions round out the program. End-users from aviation, the automobile industry, packaging, energy technology as well as brand owners will highlight future application possibilities.

The initiative "Aktionslinie Hessen-Nanotech" of the Hessian Ministry of Economics is a LOPE-C partner.

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Topics at LOPE-C:

- Organic photovoltaics
- Printed RFID (radio frequency identification) for brand protection and logistics
- Printed memory for games and consumer goods
- OLED lighting
- Flexible Batteries for mobile applications
- Flexible displays
- Intelligent packaging
- Organic sensors for disposable diagnostic devices in medical and environmental technology

LOPE-C Large-area, Organic & Printed Electronics Convention

www.lope-c.com

Schedule and Events

23.06.-25.06.2009 Frankfurt (Germany)

LOPE-C 2009 – Large-area, Organic & Printed Electronics Convention

International Industry Summit of the Organic Electronics Association (OE-A, a working group within the VDMA) and the Messe Frankfurt Ausstellungen GmbH (MFA) Hessen-Nanotech is present with the booth H 39.

- www.lope-c.com

02.09.2009 Wiesbaden (Germany)

Nanotechnologies for Emergency Management and Development Cooperation

Event organised by Aktionslinie Hessen-Nanotech and :response/forumnano

- info@hessen-nanotech.de

09.09.2009 Darmstadt (Germany)

Nanotechnology and Patents

Event organised by Aktionslinie Hessen-Nanotech and Patent Information Center Darmstadt (PIZ)

- info@hessen-nanotech.de

26.11.2009 Hanau (Germany)

6th Nanotechnology Forum Hessen

Congress Highlight of the initiative Hessen-Nanotech with accompanying exhibition and call for papers on the topic „Nanotechnologies for Humans and Health“

- info@hessen-nanotech.de

Further information about coming events can be found at www.nanoportal-hessen.de

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S. 3 PolyIC / S. 6 Merck

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