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PRESS RELEASE

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On the move into application: Optoelectronic systems on thin glass

The recently launched KODOS project ("Konfektionierter Dünnglas-Verbund für optoelektronische Systeme", Thin Glass Composites for Optoelectronic Systems), funded by the German Federal Ministry of Education and Research, is designed to transform thin glass into finished products along the entire value chain. The companies EMDE development of light, Volkswagen and Deutsche Werkstätten Hellerau, which focus on application development, have joined forces with the technology suppliers tesa, VON ARDENNE, Flabeg, 4JET microtech, SURAGUS, and the Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology FEP. The aim of the consortium is to be able to offer a complete modular system of functional materials, semi-finished products, tools, and technologies for the roll-to-roll production of optoelectronic systems on thin glass.

Funded by the German Federal Ministry for Education and Research.

Federal Ministry of Education and Research

Sophisticated ultra-thin glasses have been on the market for some time now. They are thinner than display glass in mobile phones or laptops and can do a lot more. Due to their excellent properties, such as flexibility, very smooth surface or scratch resistance, they are also very suitable as functional surfaces in furniture or cars and as a substrate for optical systems.

In order to serve new applications cost-efficiently and in a market-oriented manner, a consortium of nine industrial and research partners has now formed, which is laying the basis for this in the public-funded project KODOS.

The automobile manufacturer Volkswagen will evaluate and qualify the use of thin glasses as functional decorative surfaces in cars. For this purpose, the laminated optical basic devices produced in the project are to be tested for their resilience and crash safety. They illustrate the properties of functional surfaces such as lighting, decorative symbols and touch functions.

The Deutsche Werkstätten Hellerau will seal wooden surfaces with the ultra-thin glass as high-tech material and integrate additional functions such as organic light emitting diodes (OLEDs) or sensor surfaces into furniture.

Thomas Emde of EMDE development of light and consortium leader summarizes: "The aim of the project is to explore and develop economically relevant applications for thin glass. For example, OLED technology can be used as a display and control element in

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combination with touch functionality based on thin glass in architecture, furniture, household appliances and retail applications. The desired innovation is the combination of coating, structuring, contacting and lamination, as well as the development of a production-ready transition from the processed roll to the ready-to-install semi-finished product". The EMDE development of light will create in the project the requirements definitions for a process optimization in the areas of roll-to-roll and OLED production.

All the above mentioned steps pose a major challenge, especially because of the special mechanical properties of thin glass. As a result of the project, the consortium will be able to offer a complete modular system of functional materials, semi-finished products, tools and technologies.

For lamination of basic elements, tesa provides encapsulation adhesive tapes for thin glass-based organic electronic devices. These must guarantee an improved service life in order to meet the high temperature requirements of the automotive industry. In addition, technologies are being researched for full-surface and partial direct coatings of thin glass foils with functional layers, such as hole-injection layers for OLEDs, electrical contacts, or decorative prints.

Flabeg develops important process steps that are necessary to be able to use 3D-formed thin glass laminates with touch function, decoration and including splinter protection properties as built-in parts in the vehicle interior. The project partner is researching in particular the hot molding process and the lamination of uniaxially and biaxially bent thin glass.

Functional elements utilizing thin glass to be developed in the project consortium are an important basis for later integration into applications during the course of the project. An essential process at the beginning of the value chain is the functionalization of the glass surfaces by means of PVD coating.

In order to be able to produce economically, the processing of thin glass in roll-to-roll PVD coating systems is most reasonable. The aim of the plant manufacturer VON ARDENNE in the project is therefore to ensure stable, continuous process control with a high material yield and to develop quality parameters for evaluating the usability of the supplied thin glass rolls. In addition, the coating processes and components providing functionalities for subsequent processes (lamination, thermal deformation, laser cutting) are to be optimized.

In close cooperation with the scientists of the Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology FEP, conceptual solutions for the technologically and economically meaningful interlocking of individual steps in the production chain (illustration of the process chain vacuum coating - encapsulation lamination - OLED contacting and separation) are formulated. The Fraunhofer FEP specialists are developing efficient coating technologies for electrodes and OLEDs. They will introduce new structuring tiers into roll-to-roll production. At this point, the work will dovetail with the know-how of the project partner SURAGUS in the field of process-integrated

characterization of essential electrical and optical properties. SURAGUS develops the measurement technology for the characterization of the entire laminated OLED.

After successful production of the optical, thin glass-based devices, the next process step is the separation of the finished OLEDs from the roll. Currently, no reliable technologies exist at this point in the process chain. In order to use the enormous competitive advantage of roll-to-roll production, it is necessary to develop a separation technology that enables yielding OLEDs with high edge strength and service life.

An advantageous solution technology for this is laser separation, which is being researched by 4JET microtech. In principle, laser-cut glass edges can have strengths that meet the requirements of OLEDs. In particular, it is possible to produce practically any cutting contours and thus any OLED shapes. The specific challenges of glass-polymer laminates will be investigated within the framework of the joint project and competitive manufacturing technologies will be developed.

Within the next three years, the project consortium will work on the development of technologies, that are practical and suitable for industrial use. In addition, the project includes the implementation of initial persuasive basic devices with the innovative material ultra-thin glass and preparation of technology demonstrators.

The project partners thank the German Federal Ministry of Education and Research for the funding of the project "KODOS – Konfektionierter Dünnglas-Verbund für optoelektronische Systeme" (Thin Glass Composites for Optoelectronic Systems) within the framework of the funding initiative "Photonik nach Maß".

Flexible ultra-thin glass from the roll

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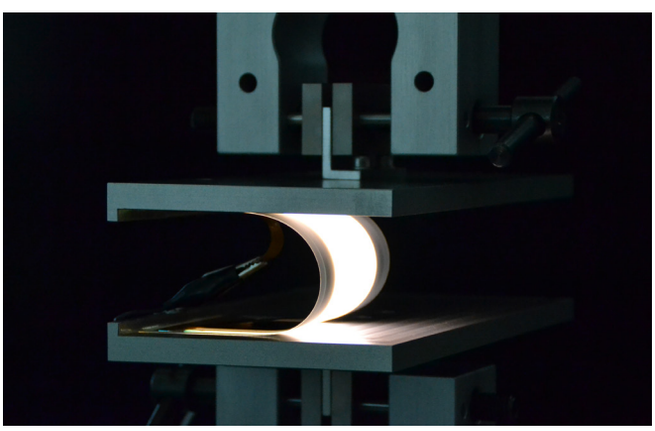
Picture in printable resolution: www.fep.fraunhofer.de/press



Bending tests on flexible OLEDs made of ultra-thin glass

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About KODOS
Konfektionierter Dünnglas-Verbund für optoelektronische Systeme

The project with a budget of more than 4.5 million euros will develop a complete kit over a period of three years (01.03.2019 - 28.02.2022) for the provision of customer-specific optoelectronic systems as semi-finished products.

Partners:

EMDE development of light GmbH, Frankfurt	Subproject „Anwendungsentwicklung OLED; Beleuchtung und Signage" (Application development OLED; lighting and signage), overall coordination Funding reference: 13N14609	www.emdegmbh.com Press contact: Thomas Emde thomas.emde@emdegmbh.com Silke Weber-Wilhelm silke.weber-wilhelm@emdegmbh.com
VON ARDENNE GmbH, Dresden	Subproject „Beschichtungstechnologie für Dünnglas"(Coating technology for thin glass) Funding reference: 13N14601	www.vonardenne.biz
tesa SE, Norderstedt	Subproject „Funktionsbeschichtung und Lamination von Dünnglas" (Functional coating and lamination of thin glass) Funding reference: 13N14602	www.tesa.com Press contact: Gunnar von der Geest Tel.: +49 40 88899-5296 gunnar.vondergeest@tesa.com
FLABEG Deutschland GmbH, Furth im Wald	Subproject „Erforschung der Anwendung ‚Automobil-Innenraum'"(Investigation of the application 'automotive interior') Funding reference: 13N14603	www.flabeg.com
4JET microtech GmbH, Alsdorf	Subproject „Vereinzelung und Strukturierung durch Laserprozesse" (Separation and structuring by laser processes) Funding reference: 13N14604	www.4micro.de Press contact: Julia Cremer Tel.: +49 (0) 2404 / 55230 – 400 julia.cremer@4jet.de
Volkswagen AG, Wolfsburg	Subproject „Anwendungsentwicklung und Applikationstest Automotive" (Application development and application test Automotive) Funding reference: 13N14605	www.volkswagen.de
Deutsche Werkstätten Beteiligungs GmbH, Dresden	Subproject: „Anwendungsentwicklung hochwertige Oberflächen" (Application development of high-quality surfaces) Funding reference: 13N14606	www.dwh.de
SURAGUS GmbH, Dresden	Subproject „Messtechnik für Elektrodenbeschichtung" (Measurement technology for coating of electrodee) Funding reference: 13N14608	www.suragus.com
Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V.: Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology FEP, Dresden	Subproject „Beschichtung von Dünnglas und Herstellung von OLED-Bauelementen" (Coating of ultra-thin glass and manufacture of OLED devices) Funding reference: 13N1460	www.fep.fraunhofer.de Press contact: Ines Schedwill Ines.Schedwill@fep.fraunhofer.de

The **Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology FEP** works on innovative solutions in the fields of vacuum coating, surface treatment as well as organic semiconductors. The core competencies electron beam technologies, roll-to-roll technology, plasma-activated large-area and precision coating as well as technologies for organic electronics and IC design provide a basis for these activities. Thus, Fraunhofer FEP offers a wide range of possibilities for research, development and pilot production, especially for the processing, sterilization, structuring and refining of surfaces as well as OLED microdisplays, sensors, optical filters and flexible OLED lighting. Our aim is to seize the innovation potential of the electron beam, plasma technology and organic electronics for new production processes and devices and to make it available for our customers.