

PRESS RELEASE

10 | 17

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June 2, 2017 | Page 1 / 4

High-performance Roll-to-Roll processing for flexible electronics

Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology FEP as one of the leading partners for research and development for surface technologies and organic electronics presents a roll of flexible thin glass, which is coated with highly conductive ITO continuously on 100 meters with roll-to-roll technology for the first time at FLEX 2017, from June 19–22, 2017 in Monterey, USA at booth no. 1004.

Functionalized and curved surfaces made of glass or plastic, rollable displays, high-quality bended surfaces for architecture or interior design in automotive or luxury furniture sector – flexible materials with integrated functionalities are not just a technological trend but capture markets already. Pioneering ideas like fully featured, curved and high-class panels in cars or a touch remote control within the armrest of your design chair are close at hand. All these features could be sealed with haptic comfortable, scratch-resistant and anti-reflective glass.

A fundamental prerequisite for such applications is a suitable and flexible substrate material, which needs to fulfill appropriate characteristics and requirements. Flexible, ultra-thin glass offers the ideal basis e.g. for printed electronic devices. Flexible electronic devices need to be protected against water and oxygen in a reliable way. Glass offers that protection but in certain applications glass may not be used due to technical or regulatory limitations. Especially for those applications and devices flexible barrier films are the solution to be used. Both ultra-thin glass and permeation barrier films require a broad technical know how and particularly adjusted processes and technologies for successful processing and coating.

Fraunhofer FEP is a leading research partner for surface treatment and vacuum coating as well as the deposition of organic electronics on flexible substrates. For many years, we have been extending and improving our expertise especially in the field of roll-to-roll process development and vacuum coating. We use a variety of research and development coating machines at our institute. Since 2015, Fraunhofer FEP is acting as a competence center for flexible glass.

Thanks to the excellent process know how of our experts and our cooperation partners, ultra-thin glass can now be processed right from the roll. Resulting from this, a full 100-meter roll of flexible glass has been processed with highly conductive ITO at a

process temperature of 350°C. This was accomplished in cooperation with our long-term partners VON ARDENNE GmbH and Corning Inc. This outstanding result had been achieved on the FOSA LabX 330 Glass. This roll-to-roll coating line for ultra-thin glass was installed recently. Since then it is operated by both Fraunhofer FEP and the manufacturer of the equipment, VON ARDENNE GmbH, in joint development projects. "This paves the way for coatings on flexible glass as a substrate, which can directly be implemented into applications", Dr. Manuela Junghänel, coordinator of all thin-glass activities at Fraunhofer FEP looks ahead enthusiastically. This coated roll of thin glass from Corning will be presented during the FLEX 2017 in Monterey for the first time.

Outstanding progress has been made in large-area roll-to-roll manufacturing technology for barrier films, as well. Dr. John Fahlteich, research group leader at Fraunhofer FEP explains the latest results: "Following an upgrade of the coating line *coFlex*[®] 600 we succeeded to produce a functionalized plastic web consisting of a permeation barrier and a transparent electrode with a defect density < 1 cm⁻² without operating in a complex and expensive clean room environment. The functional film has a surface sheet resistance of < 12 Ω. Such specifications are ideal for the use and integration in flexible OLED sheets or as a substrate for flexible solar cells." Another positive side effect is an increase of the process reliability and high yield in pilot scale. Especially for further applications like high quality packaging foils, membranes and for printed electronics these effects are resulting in a significant cost reduction and increase of the performance.

The scientists of Fraunhofer FEP will go into further detail and explain more facts and figures during their talks at the FLEX 2017 conference in Monterey/USA. They are also looking forward to meeting you at booth no. 1004.

About Corning Incorporated

Corning Incorporated (www.corning.com) is the world leader in specialty glass and ceramics. Drawing on more than 160 years of materials science and process engineering knowledge, Corning creates and makes keystone components that enable high-technology systems for consumer electronics, mobile emissions control, telecommunications and life sciences. Our products include glass substrates for LCD televisions, computer monitors and laptops; ceramic substrates and filters for mobile emission control systems; optical fiber, cable, hardware & equipment for telecommunications networks; optical biosensors for drug discovery; and other advanced optics and specialty glass solutions for a number of industries including semiconductor, aerospace, defense, astronomy, and metrology.

About VON ARDENNE

VON ARDENNE develops and manufactures equipment for industrial coatings on materials such as glass, wafers, metal strip and polymer films. These coatings give the surfaces new functional properties and can be between one nanometer and a few micrometers thin, depending on the application. The coated materials are the basis for products such as architectural glass, solar modules or touch screens.

VON ARDENNE is a leading provider of architectural glass coating equipment and coating systems for thin-film photovoltaics. The family-owned company with subsidiaries in China, Japan, Malaysia and the USA relies on customer proximity in order to offer ideal on-site service. VON ARDENNE equipment is in operation in more than 50 countries around the world.

Fraunhofer FEP at FLEX 2017**Exhibition**

Fraunhofer FEP, booth no. 1004

Conference

Tuesday, June 20, 2017

Session 3: Flexible Displays, 3:20 pm – 3:40 pm

PI-SCALE: Creating an Open Access Flexible OLED Pilot Line Service

Pavel Kudlacek, Holst Centre, Eindhoven, The Netherlands

(Fraunhofer FEP is one of the core partners of Pi-Scale consortium and responsible for the R2R anode deposition on barrier web as well as for the OLED-deposition by using evaporation processes)

Wednesday, June 21, 2017

Session 9: Conductors I, 10:50 am – 11:10 am

Advanced Sheet-to-Sheet and Roll-to-Roll Thin-film Processing on Ultra-thin Flexible Glass for Flexible Electronic Devices

Dr. Manuela Junghänel, Fraunhofer FEP, Dresden, Germany

Session 9: Conductors I, 11:10 am – 11:30 am

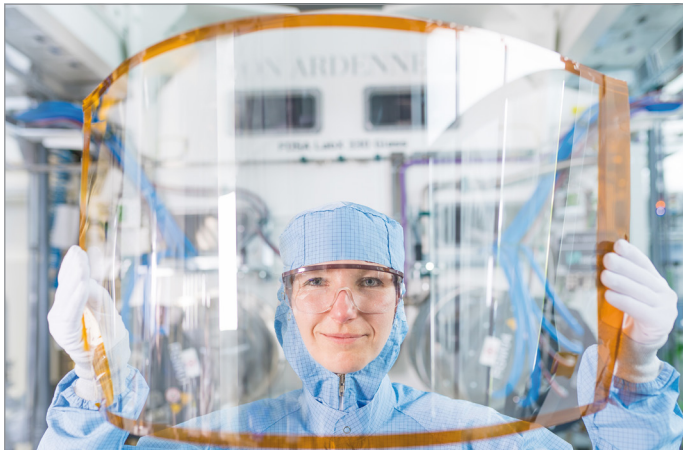
Biodegradable conductors on biodegradable polymer foils

Dr. Michael Hoffmann, Fraunhofer FEP, Dresden, Germany

Session 16: Encapsulation & Coating, 4:20 pm – 4:40 pm

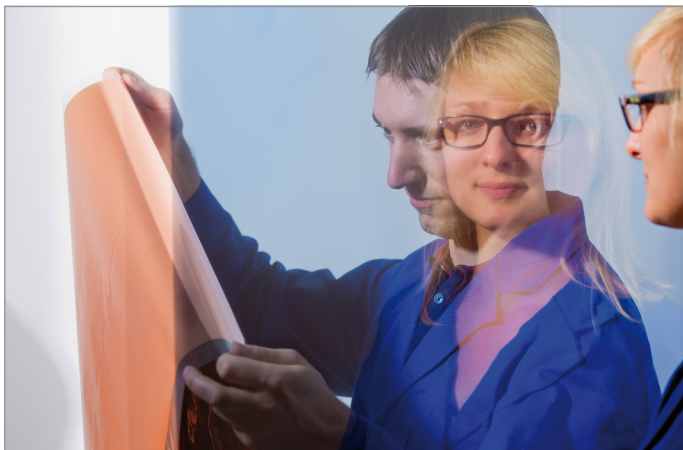
Bringing Permeation Barrier Technology to Application: From Ultra-High Barrier Films to Functional Films for Flexible Electronics

Dr. John Fahlteich, Fraunhofer FEP, Dresden, Germany

**Ultra-thin flexible Corning® Willow® Glass with a glass thickness of 100 µm**

© Fraunhofer FEP, Photographer: Jürgen Lösel

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

**Roll-to-roll coated barrier web**

© Fraunhofer FEP, Photographer: Jürgen Lösel

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

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 competences electron beam technology, sputtering and plasma-activated deposition, high-rate PECVD as well as technologies for the organic electronics and IC/system 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, organic and inorganic 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.