Fraunhofer

PRESS RELEASE

17 | 19

GLASS4FLEX – pioneering new process technologies for flexible glass in optical systems

Ultra-thin glass – one human hair thick – is ideally suited as a material for mass production of optical components and parts as well as for encapsulating optical and optoelectronic systems. Its production requires a completely coordinated process chain – from manufacture to functionalization. This is the goal to be accomplished by 2022 in the GLASS4FLEX joint research project.

Ultra-thin glass is often called the new miracle material for a wide variety of applications in optics, biotechnology, and the semiconductor industries. At less than 0.2 mm "thick", it appears to be as thin as polymer film yet has outstanding surface properties compared to plastic and metal films, such as particularly high smoothness, scratch-resistance and transparency. This makes the material particularly desirable for smart-touch surfaces and displays in consumer electronics and the automotive sector. Mass production of optical components requires materials that can serve as the basis substrate for the individual components. In addition, these kinds of sensitive optical systems must be able to be encapsulated to protect them from environmental influences. That makes ultra-thin glass well suitable for these purposes. But the trend towards ever thinner, more flexible and powerful yet lighter electronic devices and automobiles of the future is increasingly leading now to a shift in the glass thicknesses sold in mass volumes to even considerably below 0.2 mm.

Although it is currently feasible to manufacture glass in a thickness range of below 0.1 mm – which will be important in the future – it is not always possible to achieve the required specifications, however. The challenge in using such thin glass also lies in the entire process chain for its subsequent processing. In addition to the actual glass production, the cleaning and handling as well as the detection of defects in the glass are of great importance for its employability. There is currently no processing plant technology available at all that can be converted for implementing these process steps.

This is where the BMBF-funded GLASS4FLEX joint research project comes in, launched April 1, 2019. The joint project intends to develop new process technologies that do not exist yet as the pioneers for flexible glass applications in next-generation optical systems, and to establish them for developers of such optical systems.

Funded by the German Federal Ministry for Education and Research. Funding reference: 13N14615

Federal Ministry of Education and Research

PHOTONIK FORSCHUNG DEUTSCHLAND

Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology FEP
Winterbergstraße 28 | 01277 Dresden, Germany | www.fep.fraunhofer.de

Head of Marketing: Ines Schedwill | Phone +49 351 8823-238 | ines.schedwill@fep.fraunhofer.de

Head of Corporate Communications: Annett Arnold, M.Sc. | Phone +49 351 2586-333 | annett.arnold@fep.fraunhofer.de

The SCHOTT company, active in development as well as being a manufacturer of ultra-thin glass, stands at the core of the consortium. The project's participants span the entire process chain – starting with the SCHMID Group, which will be involved with the development of cleaning processes and the associated process technology for thin glass using in-line cleaning systems. The imaging and signal-processing firm Gesellschaft für Bild- und Signalverarbeitung GBS mbH will then take over the R&D for the analysis of the surface properties including the measurement system engineering.

The project addresses the handling of flexible individual large-area thin glass with a maximum size of 1.2 m × 0.6 m, where solving handling problems will be one of the greatest challenges in the project. The partners ProTec Carrier Systems GmbH and Adenso Industrial Services GmbH meet the challenge. The former – a specialist in developing secure mounting systems – will develop these for the thin glass fixation during the vacuum coating process. Adenso Industrial Services GmbH is engaged in transfer technologies for thin glass before and after vacuum coating. As part of the GLASS4FLEX project, the Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology FEP, in Dresden, Germany, will conduct research on functional optical and electrical coatings for this thin glass in sheet-to-sheet processes based on its state-of-the-art expertise.

Project coordinator Dr. Manuela Junghähnel from Fraunhofer FEP explains the goals and approach: “We want to work hand-in-hand with all six project partners to develop new process technologies for the production of high-strength thin glass that can withstand full mechanical stress despite its low thickness. The development of safe cleaning and defect inspection of these types of glass are integral to this, as are the mounting system and functional coating.”

The result should be the presentation by 2022 in Dresden of the first coated large-area thin glass with colour-neutral scratch protection and a transparent electrode, made with a fully developed process chain. In addition, the other main objective is to establish a pre-commercial infrastructure in Dresden that will enable system manufacturers from all the areas mentioned to develop prototype optical components on the basis of coated ultra-thin glass.

The project’s R&D intends to reduce the thickness of current glass-based systems for better mechanical properties without reducing protective effects. The optical elements and the processes required for their manufacture should be suitable for as many applications as possible, especially in the fields of mechanical and plant engineering, electronics, lighting, medical engineering, environmental analysis, and vehicle construction.

The Fraunhofer FEP has been conducting research in coating technologies for ultra-thin glass for several years. Outstanding results have already been achieved in the development of roll-to-roll technologies for depositing inorganic materials on flexible glass. The Institute's unique expertise in research and development for flexible glass will be supplemented by the project.

GLASS4FLEX project partners

SCHOTT AG
Grünenplan
www.schott.com

Schmid Group
Freudenstadt
www.schmid-group.com

Gesellschaft für Bild- und Signalverarbeitung GBS mbH
Ilmenau
www.gbs-ilmenau.de

Adenso Industrial Services GmbH
Dresden
www.adenso.solutions

ProTec Carrier Systems GmbH
Siegen
www.protec-carrier.com

Fraunhofer FEP
Dresden
www.fep.fraunhofer.de

The goal of the GLASS4FLEX project: design of comprehensive techniques to continuously process thin glass for high-volume markets
© Fraunhofer FEP, Photographer: Jürgen Lösel
Picture in printable resolution: www.fep.fraunhofer.de/press

Flexible ultra-thin glass as the material of the future
© SCHOTT AG
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 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.