FRAUNHOFER FEP – A RESEARCH HUB FOR REFINEMENT OF ULTRA-THIN GLASS
AN EMERGING SUBSTRATE FOR CUTTING-EDGE TECHNOLOGIES
We offer the development of reliable processes for thin-film deposition on ultra-thin glass as well as the integration of ultra-thin glass for applications in novel flexible (organic) electronic devices.

Our capabilities in thin-film deposition are outlined below:

### Emerging substrate

Ultra-thin glass with thicknesses of lower than 100 μm opens up opportunities for new applications, especially in the area of high-end electronics. It paves the way for the development of thin, light, robust, curved and bendable devices. With a bendability similar to other web materials, ultra-thin glass excels polymers in dimensional and thermal stability and chemical resistance. Thus, ultra-thin glass is a perfect substrate for cost effective roll-to-roll deposition of high quality functional layers and layer stacks.

### Our offer

We offer the development of reliable processes for thin-film deposition on ultra-thin glass as well as the integration of ultra-thin glass for applications in novel flexible (organic) electronic devices.

<table>
<thead>
<tr>
<th>equipment *</th>
<th>substrate size</th>
<th>glass thickness</th>
<th>deposition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sheet-to-sheet (S2S) processing</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pilot scale in-line coating machine ILA 900</td>
<td>max. 600 x 600 mm²</td>
<td>50 μm ... 200 μm</td>
<td>inorganic thin-films</td>
</tr>
<tr>
<td>OLED pilot line</td>
<td>max. 200 x 200 mm²</td>
<td>50 μm ... 100 μm</td>
<td>organic thin-films</td>
</tr>
<tr>
<td><strong>Roll-to-roll (R2R) processing</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FOSA LabX 300 (in cooperation with VON ARDENNE GmbH)</td>
<td>max. 300 mm width</td>
<td>50 μm ... 100 μm</td>
<td>inorganic thin-films</td>
</tr>
<tr>
<td>OLED line</td>
<td>max. 300 mm width</td>
<td>50 μm ... 100 μm</td>
<td>organic thin-films on glass-PET-laminates</td>
</tr>
</tbody>
</table>

* For PDF documents of the corresponding equipment, please refer to: www.fep.fraunhofer.de/equipment

### Applications

- Automotive interior/exterior design
- Displays
- Wearables
- Sensors
- High tech optics
- Smart surfaces
- Smart windows
- Building integration
- Photovoltaics
- Energy storage systems
- Furniture
- Lighting
Research focuses

PVD processing
The team of Fraunhofer FEP gained an extensive know-how to adjust processes and stress management depending on a target application. Moreover, Fraunhofer FEP is working on the deposition of homogeneous coatings based on complex layer stacks, e.g., edge filters (Fig. 4).

Integration
Fraunhofer FEP demonstrated the application of ultra-thin glass as a substrate and barrier for S2S and R2R processed OLED on several prototypes (Fig. 2 and 3). Currently, we are focusing on the reliability of the material during integration and contacting process.

Management of mechanical film stress

Management of mechanical film stress for ITO films on 100 µm ultra-thin glass by variation of the process pressure and the applied power during the magnetron sputtering.

After processing the OLED in S2S or R2R line, the thin glass substrate will be laminated in composites for manufacturing a lighting device. We offer integration know how for glass-glass, glass-plastic and glass-wood laminations and their electrical contacting.

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We focus on quality and the ISO 9001.