

Flexible Permeation Barriers

Enabling light and power from the roll

The Fraunhofer FEP is a world leader in the development of transparent and flexible high permeation barriers for a broad field of applications. These high-barrier layers provide excellent protection against oxygen and moisture, thus extending the service life of the products.

They are used in innovative packaging solutions where they help to keep food fresh for longer. They are also essential for flexible electronics and flexible solar cells, as they improve the functionality and efficiency of

these technologies. Electrochromic systems also benefit from these barriers as they ensure stable and long-lasting performance.

The Fraunhofer FEP offers customized research and development as well as the best possible technological approaches based on our many years of experience in coating technology for flexible substrates in accordance with the technical requirements and economic goals of our customers.

Applications

Permeation barriers are vital for a range of applications. Fraunhofer FEP has an extensive experience in R&D and pilot manufacturing of high-quality barrier films for:

- Flexible packaging
- Smart packaging
- Flexible organic electronics
- Flexible photovoltaic devices
- Electrochromic systems
- Holographic systems on polymers
- Thin film energy harvesting and energy storage devices
- Sensors and flexible/organic transistors
- Quantum dot and OLED displays
- Wearables and other flexible electronic devices

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Coating equipment

Fraunhofer FEP uses a set of roll-to-roll vacuum coating machines for laboratory and pilot production scale up to 650 mm web width.

Lab coater: *labFlex® 200*

- 220 mm web width
- Sputtering and PECVD
- Roll-to-roll direct encapsulation without roller contact of coated side

Pilot coaters: *coFlex® 600* and *novoFlex® 600*

- 650 mm web width (pilot scale)
- Sputtering, PECVD and evaporation
- Multilayer deposition in one run
- Web speed up to 10 m/s
- Double-side coating

Our offer

Our services include contract R&D, joint development, technology transfer and licensing focusing on:

- Evaluation of polymer substrates for barriers
- Sampling, material provision and feasibility studies
- Roll-to-roll pilot production of barrier film rolls
- Adaption of barrier films to specific application
- Functional film design and deposition
- Product integration
- Key components for barrier layer deposition
- Direct thin film encapsulation of devices
- Barrier film and device characterization
- Roll-to-roll particle and defect inspection
- Large-area water vapor transmission rate (WVTR) measurement down to 10^{-6} g/(m²d)

Our mission

With our key technologies your products are one step closer to the market. Don't hesitate to contact us with your specific needs.

Technologies

For each application, we provide the best suitable technological approach taking into account technical requirements and economic targets. Our technologies include:

Technology	Productivity [m/min]	WVTR at 38°C / 90% r.h. [g/(m ² d)]
Plasma-assisted hollow cathode evaporation	600	1
Reactive sputter deposition	1	0.1 ... 0.005
Reactive sputter deposition with permanent protective film	1	0.001 ... 0.0005
Multi-layer stack single pass: sputtering + arcPECVD	≥ 4	0.005