

# Permeation barriers

## Enabling light and power from the roll

### 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

### Technologies

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

Technology	Productivity (line speed) m/min	WVTR at 38°C/90% r.h. [g/(m <sup>2</sup> d)]
Hollow-cathode plasma-assisted evaporation (HAD)	600	1
Reactive sputtering of oxides	1	0.005
Multi-layer stack: sputtering + wet coating of ORMOCER®	1	0.0002
Multi-layer stack single pass: sputtering + arcPECVD	≥ 4	0.005
Atomic layer deposition	static process	< 0.001

### Contact

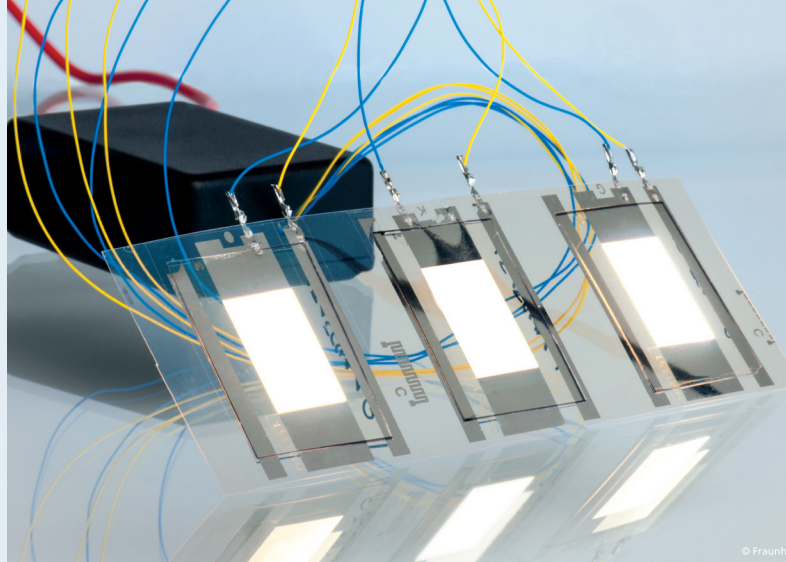
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## Coating equipment

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*<sup>®</sup> 200

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

### Pilot coaters: *coFlex*<sup>®</sup> 600 and *novoFlex*<sup>®</sup> 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 WVTR measurement down to  $10^{-6}$  g/(m<sup>2</sup> d)
- HiBarSens<sup>®</sup> coulometric

## 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.