FLEXIBLE TRANSPARENT GAS BARRIER FILMS



Development of cost-efficient flexible gas-barrier films for encapsulation of sensitive electronic devices based on thin-film technologies is a current challenge for their industrial application. Photochemical processes, developed at the IOM, can be used to produce these films at normal pressure and temperatures below 80 °C. A pilot-scale coating machine has been designed and constructed with the aim to further develop gas-barrier films and their production technology. The machine enables scale-up to wider substrates (up to 1 m web width), demonstrations in true technical scale, and profound economical evaluation of the production process.

- **Low-temperature processes for preparation of metal oxide thin films**
- **Silicon oxide thin films for flexible transparent high gas permeation barrier**
- **Lamination of single layer films (up to 500 mm web width)**

THE INSTITUTE

The Application Center of the IOM is a technology platform for the efficient and sustainable transfer of IOM research results to industrial partners. Radiation-based high technologies, new process technologies, and products can be developed at the IOM for industry under industry-relevant conditions. The aim is to transfer technological developments from pilot scale to scale up, especially in the fields of optical and chemical industry, semiconductor technology, mechanical engineering and medical technology. Various high-tech irradiation and coating systems are available in the application center for this purpose.

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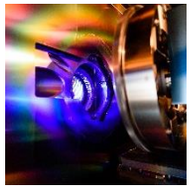
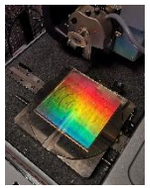
APPLICATION CENTER OF THE IOM

TAILORED SURFACES

REACTIVE ION BEAM ETCHING (RIBE)

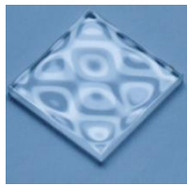
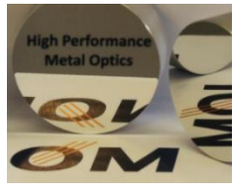


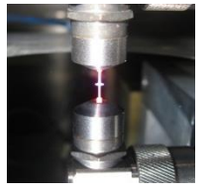


Reactive ion beam etching (RIBE) is a sophisticated technology enabling the fabrication of e.g. optical elements with sub-atomic precision. Within the extended research infrastructure a new state-of-the-art RIBE facility was established. The integrated 5 axis-motion system enables now uniform etching of large workpieces with diameters up to 450 mm and a maximum weight of 50 kg. The RIBE system is equipped with a Kaufman-type ion source, configured for Fluorine-containing etching gases, and can be upgraded with different optical and masspectroscopic in-situ measurement technologies which guarantee high process stability and reliability. With the RIBE 450 etching plant, newly developed IOM etching processes for ultraprecise and innovative structured functional surfaces can be further scaled up to industrially relevant sizes.

- **Ion beam driven self-organization**
- **RIBE for pattern transfer**
- **IBE/RIBE on large surfaces**
- **Ion beam assisted surface smoothing**

PLASMA JET PROCESS FOR ULTRA-PRECISION SURFACE TREATMENT

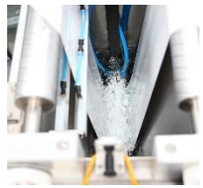



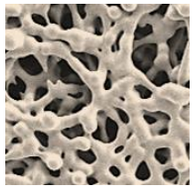


Plasma jet-based processing chains for the manufacturing of optical freeform surfaces of fused silica are comprise of several machining steps including plasma jet polishing. The main advantage of the plasma jet polishing process is its action independent of surface curvature. Hence, shape-preserving smoothing is achieved even on surfaces with variable surface curvatures like aspheres or freeforms. The plasma jet polishing machine is based on a 4-axis CNC platform equipped with a specially designed microwave-driven inert plasma jet source. The machine allows to treat fused silica surfaces with lateral dimensions up to 250 mm in diameter obtaining micro-roughness values of less than 0.3 nm RMS.

- **Plasma jet machining**
- **Plasma assisted polishing**
- **Ion beam figuring**
- **Reactive plasma jet sources**

ELECTRON BEAM-BASED MEMBRANE MODIFICATION





Porous polymer membranes are of increasing importance regarding modern separation technologies such as waste water treatment, sterilization filtration, hemodialysis, dairy industry, etc. To comply with required process conditions these polymer membranes are predominantly fabricated from synthetic hydrophobic polymers. However, these materials are prone to fouling. Electron beam technology can be efficiently used for the hydrophilization of polymer membranes by directed grafting of hydrophilic small molecules/polymers to the membrane surface. This machine (80 – 200 keV) enables an upscaling (roll-to-roll) of our method using hollow fibres or flat sheet membranes with individual pre- and post-treatment.

- **Electron beam modification of polymer membranes**
- **Photocatalytically active membrane surfaces**
- **Bioactive membrane surfaces**