



CLEAR BARRIER FILMS FOR PACKAGING APPLICATIONS A BREAKTHROUGH TECHNOLOGY TO COAT POLYMER FILMS WITH A CLEAR BARRIER LAYER

Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology FEP

Winterbergstr. 28
01277 Dresden, Germany

Contact persons

Steffen Straach
Phone +49 351 2586-132
steffen.straach@fep.fraunhofer.de

Dr. Nicolas Schiller
Phone +49 351 2586-131
nicolas.schiller@fep.fraunhofer.de

www.fep.fraunhofer.de

Fraunhofer FEP developed a technology to coat common polymer films with transparent barrier layers composed out of aluminum oxide. The barrier keeps out the main culprits of food deterioration: oxygen and humidity. The aluminum oxide layers have similar barrier properties than aluminum layers, combined with the advantage of being transparent. The transparency is important especially in the food packaging sector, where the consumer prefers a visual impression of the goods.

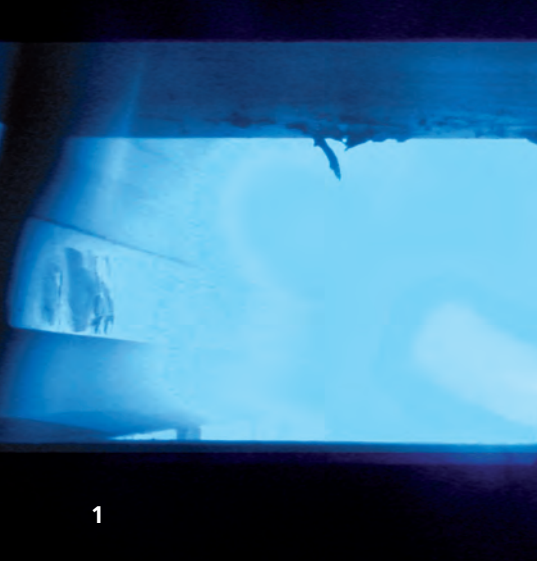
However, the crucial advantage of the technology is the high coating rate.

Therefore, the technology represents a cost-effective solution to achieve powerful coatings, which are interesting for commodity products, especially for packaging materials. The technology has already been industrially realized and is commercially available on the market.

The key technology is a vacuum-based, roll-to-roll coating process that can coat several thousand square meters of polymer film in a single hour. The film can be a common polymer like PET and polypropylene (PP). Further biodegradable films, such as polylactic acid (PLA), can be coated, too.

Manufacturing partner





1



2

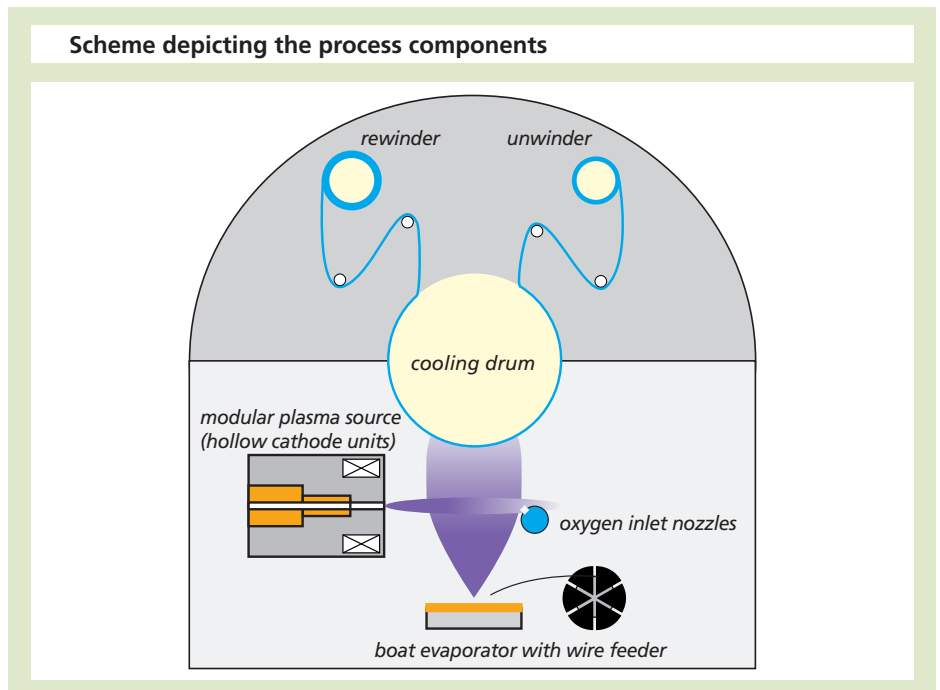
Technology

The scheme depicts the basic configuration of a web coater for plasma assisted reactive deposition of aluminum oxide. As in a standard web coater, the evaporation of aluminum takes place from boats with continuous wire feeding. For the reactive deposition, gas inlet nozzles are placed in close position to the evaporation zone. In addition, a modular plasma system is installed to enhance the barrier properties. An in-line monitoring system is used to continuously measure the optical transmission of the coated film and provide a control signal for the oxygen flow set point.

The technology can be scaled to virtually any web width. Industrially established speeds are beyond 8 m/s.

Characteristics*

The table summarizes the barrier properties of several aluminum oxide coated polymer films. The barrier films are fully transparent and show outstanding barrier properties for packaging applications.



| Polymer film type thickness | OTR [cm ³ /m ² d bar] (23°C, 0% r. h.) | WVTR [g/m ² d] (38°C, 90% r. h.) |
|--------------------------------|--|---|
| PET 12 µm | < 3 | < 2 |
| BOPP 17 µm | < 100 | < 1 |
| PLA 20 µm | < 25 | < 25 |
| CPP 17 µm | < 100 | < 1 |

* values can vary depending on the substrate

Application

The main application is food packaging based on BOPP, PET, PLA and other polymer films. Customers report excellent converting performance.

Our offer

- sample coatings on customer-specific substrate
- transfer of the technology on designated band width
- supply of core components and technology



- 1 Inside view of the coating zone: Plasma enhanced process to enhance product properties and converting performance.
- 2 Hollow cathode units