



Freshure[®] Coatings

Environmentally-friendly transparent barrier coatings





Innovation in high-performance clear vacuum barrier coatings: cost-effective results without compromise

Flexible packaging - particularly metallised films - and aseptic containers are today the focus of brand owners and retailers across the globe. Especially for food and liquids, they offer consumer convenience, lighter weight, and ease of handling. New Freshure® Coatings, created using patented Symphase® technology, can add a significant additional benefit for packaging producers: lower cost of ownership than traditional vacuum coating processes - without in any way compromising quality. This unique technology is now available for commercial licensing within the flexible and food packaging industry.

A new coating solution for packaging

Symphase® technology is based on the vapour deposition of organic compounds which are compliant with both FDA and EU regulations for food packaging applications. In addition these materials are inexpensive, widely available, environmentally-friendly, fully recyclable, and biodegradable.

Symphase® technology is developed by DSM, a global science-based company active in health, nutrition and materials. The Symphase® process uses supramolecular chemistry to create two types of functional coating: Freshure®-Single Coat - a single layer, transparent, high gas barrier coating; and Freshure®-Top Coat - an in-line topcoat to protect vacuum-coated layers offering improve barrier performance.

The coating process

Symphase® is a 'soft' deposition process that requires no expensive cooling or vacuum systems. Under moderate vacuum conditions and above their sublimation temperatures specifically chosen organic compounds can cover large surface areas in a fraction of a second, creating thin layers of transparent crystalline coating with very high gas barrier properties. This can be achieved via a roll-to-roll coating process at speeds higher than 10m/s, on wide plastic rolls of substrates such as BOPP, PET, and PLA.

What does it offer for YOUR production process?

Symphase® offers high-speed coating, whichever Freshure® Coatings pathway you choose to follow, and is commercially proven. In collaboration with roll-to-roll coating equipment supplier Applied Materials Symphase® process has been developed for implementation on Applied's industry-proven TopMet Clear vacuum metallising system. This enables Al metallisation in combination with Freshure®-Top Coat for improved barrier properties and consistent surface tension; or in combination with AlOx Clear Barrier - an inorganic layer that offers excellent barrier properties, improved mechanical stability and printability with Freshure®-Top Coat. As standalone transparent layer Freshure®-Single Coat provides high gas barrier on various polymeric films such as PET, BOPP and PLA.

The two Freshure® coating pathways offer impressive performance in packaging applications, and deliver real opportunities to enhance barrier and application possibilities in a very cost-effective manner.



Freshure®-Single Coat

Freshure®-Single Coat provides transparent high-gas-barrier on a variety of plastic packaging films - at a very competitive cost. Typical oxygen barrier values obtained on polymeric films generally used in flexible packaging are outlined in the table below:

Substrate	OTR ¹ (cm ³ /m ² /day) 23°C at 50% RH
BOPP (20µm)-Freshure®	< 20 (1600)
PET (12µm)-Freshure®	< 2 (110)
PLA (20µm)-Freshure®	< 5 (800)
BOPA (12µm)-Freshure®	< 1 (38)

¹ Numbers in the brackets indicate the OTR values of uncoated films.

Oxygen barrier values obtained with Freshure® are superior as compared with alternatives barrier materials such as PVdC and EVOH.

Freshure® coated films can be converted and laminated with conventional methods used in packaging industry. Typical barrier values for laminates based on Freshure® coated films are outlined in the table below in addition to bond strength values:

Laminate ¹	Barrier Values		Bond Strength (N/25mm)
	WVTR (g/m ² /day) 23°C at 85% RH	OTR (cm ³ /m ² /day) 23°C at 50% RH	
PET12µ-Freshure®//PE70µ	0.7	1.0	> 3
OPA15µ-Freshure®//PE70µ	0.6	0.3	> 3

¹ Laminates are prepared using standard solventless glues.

Main features of Freshure® Single Coat:

- High gas barrier
- Transparent
- Microwavable
- UV barrier
- Can be converted using standard printing (Flexography & Rotogravure) and lamination techniques
- Much more flexible as compared with metal oxides such as AlOx
- Compliant with both FDA and EU regulations
- Chlorine free barrier coating - environmentally friendly and biodegradable
- Low coating weight (< 0.3 g/m²) in combination with low cost of raw material resulting in competitive total cost of ownership



Freshure®-Top Coat

Freshure®-Top Coat provides 'active' protection of an oxide-coated/metallised layer, giving improved all-round barrier performance - in the vacuum chamber, during conversion, and in food packaging. It retains its high surface tension (> 56 dym/cm) for more than 12 months - compared to 60 days with standard metallised films - so no in-line corona treatment is required prior to conversion, and lamination speed can be increased by at least 30%. Typical oxygen barrier values of metallised films top coated with Freshure® are outlined in table below:

Substrate	OTR ¹ (cm ³ /m ² /day) 23°C at 50% RH	
	Without Freshure® Top Coat	With Freshure® Top Coat
CPP20µ-AI	> 300	< 20
BOPP20µ-AI	50-100	< 10
PET12µ-AI	1-2	< 0.5
PET12µ-AIOx	~ 2	< 1

¹OTR values for metallised films are given for an average OD of 2.0

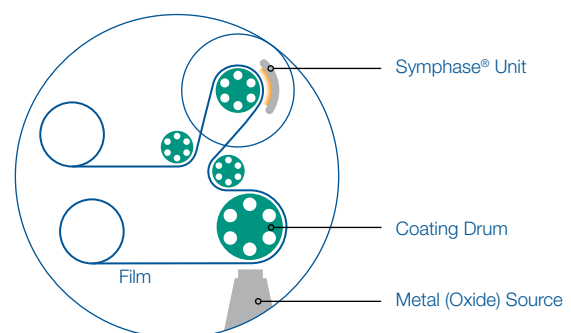
Application of Freshure® as inline Top Coat protects the metal oxide layers such as AIOx during down steam processing steps like printing and retort at a fraction of the cost of alternative offline lacquering systems. Typical barrier values for AIOx coated PET top coated with Freshure® after conversion and retort are outlined in the table below:

PET12µ-AIOx-Freshure®	OTR (cm ³ /m ² /day) 23°C at 85% RH	WVTR (g/m ² /day) 38°C at 90% RH
After slitting and lamination ¹	< 0.5	< 0.5
After retort (30 min at 121°C)	< 1.0	< 1.0

¹Laminated with BOPA/CPP

Main features of Freshure® Top Coat:

- Printable with both Flexography and Rotogravure using commercially available inks
- Barrier retention after slitting, printing, lamination and packaging.
- Constant high surface tension independent of film type (> 56 dyn/cm)
- Scratch resistant
- No loss in glossy appearance of metallized films
- Improved oxygen barrier
- High lamination bond strength (> 3 N/15mm)
- Suitable for retort and sterilization
- Microwavable
- Chlorine free barrier coating - environmentally friendly
- Complaint with both FDA and EU regulations
- Inline process with limited additional cost



Vacuum Chamber

License the technology

Knowfort is your port to game changing technologies. Active primarily in the field of materials, we license cutting-edge, sustainable and innovative technologies. Our intellectual property portfolio consists of both worldwide granted patents and associated know-how. Use them to bring value to both your costumers and your shareholders.

Knowfort's Symphase® patented technology for the production of Freshure® Coatings is now available for licensing for flexible packaging applications.

Find out how, with limited investment, this real innovation can create high barrier coatings on today's leading-edge food packaging, in confidence and without obligation.

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