

### License the technology

Knowfort, a DSM subsidiary, 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.

For more information visit our website: [www.symphase.com](http://www.symphase.com)

Or contact:

Knowfort Technologies BV

P.O. Box 18

6160 MD Geleen

Tel +31 46 476 0151

Fax +31 46 476 0168

E-mail [info@knowfort.com](mailto:info@knowfort.com)

[www.knowfort.com](http://www.knowfort.com)



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# Freshure<sup>®</sup> Coatings

Environmentally-friendly transparent barrier coatings



Freshure®-Single Coat



Freshure®-Single Coat



## 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

The Symphase® technology used to create Freshure® Coatings is based on the vapour deposition of melamine - a material widely-used in the manufacture of many wood- and paper-based products such as decorative and floor laminates. Melamine is inexpensive, widely available, environmentally-friendly, fully recyclable, biodegradable, and FDA-approved for food contact.

Freshure® Coatings are introduced to the packaging market by DSM, the world's leading manufacturer of melamine. The Symphase® process uses a combination of nano-technology and 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 and improve barrier performance.

### The coating process

Melamine coating is a 'soft' deposition process that requires no expensive cooling or vacuum systems. Under moderate

vacuum conditions and above its low sublimation temperature of 200°C, melamine can cover large surface areas in a fraction of a second, creating a nano-layer 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 films 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. Melamine evaporators can be successfully retrofitted to existing vacuum metallisers, and a brand new vacuum coater will shortly come on line with a 1.6M wide melamine evaporator.

With a relatively low investment, and low-cost source material, you can achieve shorter cycle times, thanks to reduced pump downtimes and cooling periods.

Again, the low coating temperature makes it possible to coat temperature-sensitive polymers such as PE, and - unlike Al metallisation - there is no requirement for special-grade temperature-resistant BOPP films. These are significant enhancements to your vacuum-coating capability.

### Barrier properties: performance in packaging

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®-Top Coat



Freshure®-Top Coat



### Freshure®-Single Coat

Freshure®-Single Coat gives a transparent high-gas-barrier coating on a variety of plastic packaging films - at a very competitive cost - and it can be converted under standard conditions for lamination. The coating is micro-waveable and less brittle than metal oxide coatings, and has self-healing properties. For certain laminated structures, the oxygen barrier properties can be retained at very high temperatures and humidities.

Substrate	OTR [cc/m2/day, 23°C/0% RH]
BOPP (20 µm)	1600
BOPP/ Freshure®-Single Coat	< 20
PET (12 µm)	110
PET/ Freshure®-Single Coat	< 5
PLA (20 µm)	800
PLA/ Freshure®-Single Coat	< 40

Oxygen barrier

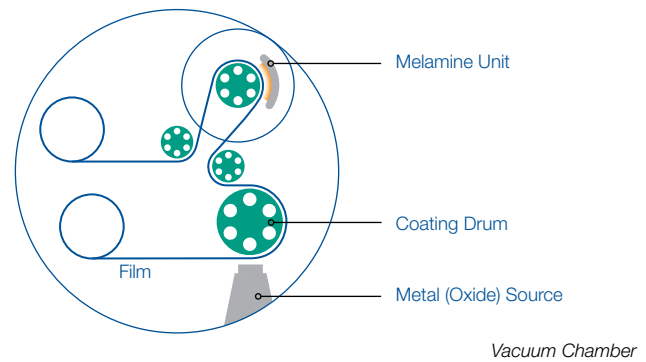
Sample	OTR (cc/m2*day)		
	0% RH	85% RH (23°C)	85% RH (40°C)
PET/ Freshure®-Single Coat 1	2.1	2.6	1.9
PET/ Freshure®-Single Coat 2	1.2	1.3	1.1
PET/ Freshure®-Single Coat 3	0.5	1.5	n.d.

Oxygen barrier

### 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 surface tension for 6-12 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%.

An additional, and valuable, benefit of melamine coating is its instant printability - which can also save processing time and cost. Conventional metallised films often require off-line print primers, which can damage the oxide/metallised layer and reduce metallic gloss.



Clear film packaging providing a 'window' on the pack to show the product itself is a good example of the possibilities of Freshure®-Single Coat.