

EXCEVAL™ — Gas barrier film for protecting your food



kuraray

Kuraray Poval™

EXCEVAL™

The solution for barrier requirements

EXCEVAL™ is the trademark of Kuraray's hydrophobically modified polyvinyl alcohol (PVOH), especially designed for the requirements of the barrier coating industry. The new chlorine-free barrier resin is water-soluble like standard PVOH such as KURARAY POVAL™, Kuraray's globally produced PVOH. However, coatings made of EXCEVAL™ absorb significantly less humidity at average temperature conditions. Therefore, EXCEVAL™ provides coatings with excellent gas barriers, e.g. towards oxygen, nitrogen and carbon dioxide – even at elevated relative humidity. Furthermore, the resulting coatings are highly transparent and glossy, have a strong chemical resistance, and provide good adhesion to metal as well as excellent printability. EXCEVAL™ is a recyclable material used under conditions listed in the RecyClass guidelines, therefore present new opportunities to expand the design space for mono-material packaging.

EXCEVAL™

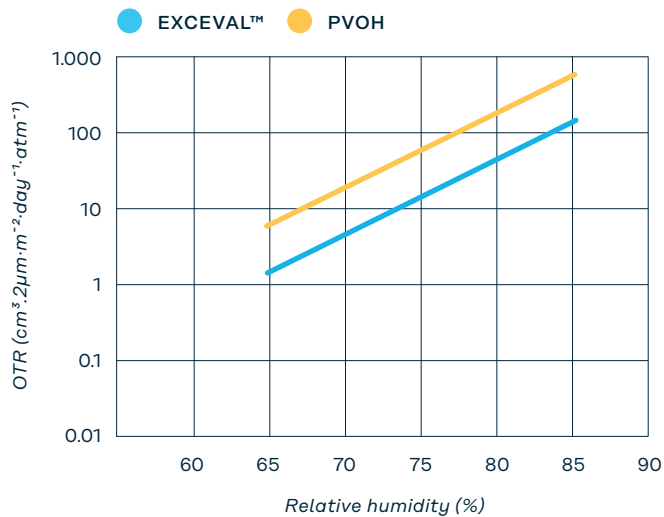
Applications devised for your products

EXCEVAL™ enables a barrier of less than 10 (cc•2µm/m₂•day•atm) (very high oxygen barrier) even at high degrees of relative humidity. EXCEVAL™ can be applied as a solvent free, chlorine-free and recyclable waterborne coating on numerous substrates and provides a superior barrier level compared to traditional coatings.

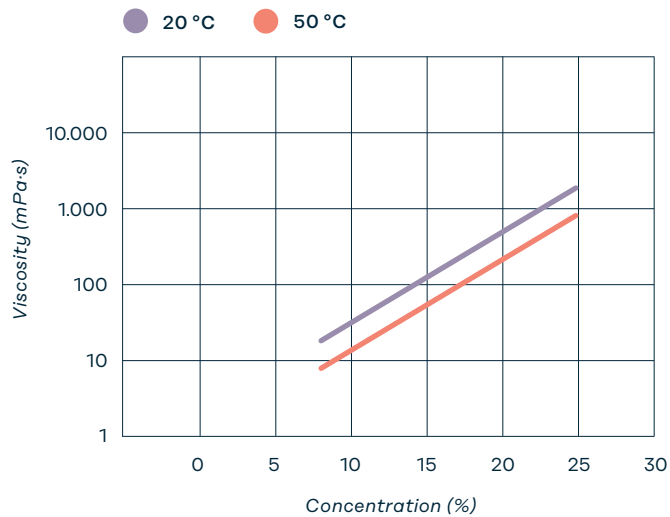
Because of the need to control gas and water vapour permeation simultaneously while providing mechanical performance, the structure of a packaging film will consist of several layers, each of them contributing to one or several properties of the film construction. A base layer that may be constituted of polyolefin materials, have low water vapour permeation and also providing some mechanical resistance will be combined with an oxygen barrier layer of EXCEVAL™. In such a structure there are also further layers that provide specific functionalities like primers, adhesives, inks, etc.



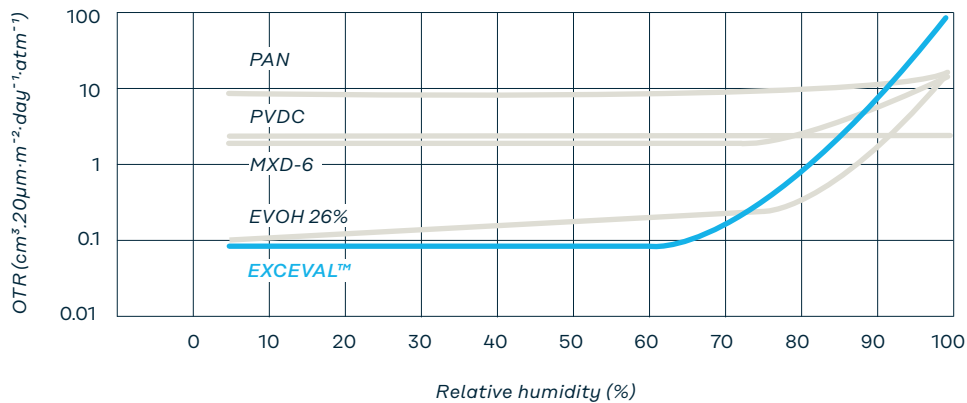
EXCEVAL™ – performance that is simply convincing



Oxygen Transmission Rate of EXCEVAL™ compared to standard PVOH at 20 °C



Viscosity of low-viscous EXCEVAL™ grades



Oxygen Transmission Rate of EXCEVAL™ compared to standard barrier coating materials at 20 °C

The Oxygen Transmission Rate

of a PE film coated with EXCEVAL™ and metallised is analysed at 23 °C, 65 % RH, in 100 % Oxygen atmosphere:

Oxygen Transmission Rate cm³·m⁻²·day⁻¹·atm⁻¹	Initial	After 20 Cycles Gelbo-Flex-Test
Towards O₂-Side	< 0.1	< 0.1
Towards N₂-Side	< 0.1	< 0.1

EXCEVAL™ shows outstanding performance as gas barrier layer – even after 20 torsions of the film.

EXCEVAL™ — designed to preserve the good taste

EXCEVAL™

Non-metallised film applications

Packaging films preserve a wide range of various food types with a typical construction consisting of two layers of PE, PP, PET and PA. The films are used for confectionery, bread, frozen meat products, rice, and cereal to name a few. Most of these materials are supplied as finished films with Flexi-printing. A thin layer of EXCEVAL™ of less than a few μm is coated directly with or without primer on these different substrates. In order to protect EXCEVAL™ from humidity, EXCEVAL™ can be top-coated or laminated with substrates that have low water vapour permeation. PE is mainly used as welding layer in this construction. Another typical application of transparent barrier films is food tray lids.



*Keeping it crisp and aromatic:
coatings with EXCEVAL™ provide
excellent protection for fresh food.*



EXCEVAL™

Metallised film applications

Metallised film such as PET, SiOx-coated PET and new high-barrier metallised BOPP are used in a wide variety of food packaging applications where either high barrier properties or striking appearance is required in packaging for crisps (BOPP) and coffee. In addition, vacuum-metallised papers are employed as liners for cigarettes, packaging for pharmaceutical products, dairy products, confectionery and gift wrapping, wet glue label and outer liner for carton.

Pinholes in a metallised substrate are the main pathway for permeation. Pinholes account for the majority of the oxygen permeation but only for about 20% of the water vapour permeation. Most of the water vapour permeation through a metallised layer is due to nano-scale defects on the surface.

The main way to improve the gas barrier properties in film construction is to perform the metallization on top of a polymeric gas barrier layer like EXCEVAL™. Utilising EXCEVAL™ as the polymeric gas barrier layer, the pin holes are filled and consequently the overall gas barrier performance of the metallised substrate increases significantly. Furthermore, the use of EXCEVAL™ as a polymeric gas barrier layer will avoid the necessity of performing a seeding metallization process that contributes significantly to the deterioration of the flexibility of the packaging film. Another way is to perform metallization on top of EXCEVAL™. EXCEVAL™ acts as a good primer, enhancing adhesion of metallised layer on films, while improving overall gas barrier performance.



Frequently asked questions

How can I increase the coat weight?

Increasing the coating temperature will reduce the viscosity. Depending on the coating temperature the total solid content can be adjusted. By increasing the solid content the drying time can be reduced.

How to dissolve EXCEVAL™?

EXCEVAL™ should be dispersed in cold water and then be heated to 95 °C inner temperature and kept for 2 hours. The solution should then be cooled down slowly.

Storage of solutions of EXCEVAL™!

Upon storage at low temperature, gelation in solutions of EXCEVAL™ may occur. Storage at elevated temperature as well as addition of isopropanol (IPA) will reduce the gelling tendency.

How can possible foaming of solutions of EXCEVAL™ be prevented during dissolution and application?

Adding 10% isopropanol to EXCEVAL™ will considerably reduce the foam formation in the dissolving vessel. The subsequent addition of IPA reduces the foam formation on the gravure rolls. IPA will also significantly improve the wetting of EXCEVAL™ on the plastic substrate. Furthermore, reducing the viscosity of solutions of EXCEVAL™ contributes to a reduction of the foam formation on the gravure rolls.

What total solid content can I prepare?

Typically a 10–15% solution should be made.

At what temperature do I need to dry?

No specific temperature is needed as solutions of EXCEVAL™ are forming a film upon drying. In contrast, PVDC needs elevated temperatures to form a film by particle coalescence.

How much material is required to achieve a high gas barrier level?

A dry weight of 1–2µm is enough to achieve a high gas barrier level (permeation less than $1 \text{ cm}^3 \cdot \text{m}^{-2} \cdot \text{day}^{-1} \cdot \text{atm}^{-1}$).

How do I improve the barrier properties?

Crystallisation is the driving force behind the barrier performance of EXCEVAL™. Any temperature treatment will improve the barrier performance. Storage of the coated film at elevated temperatures (50 °C for several days) will allow the improvement of the gas barrier level.

How to improve the water resistance?

Crosslinking will improve the water resistance; however, excessive cross-linking will reduce the barrier performance. A metal binding complex and organic cross-linkers are well known to improve water resistance while maintaining the excellent barrier level.

Can I print on EXCEVAL™?

Yes, it has a very good affinity with printing inks.

Does torsion affect barrier performance?

To estimate the flexibility of the packaging film, the barrier properties are evaluated before and after mechanical torsion (Gelbo Flex test). Even after 20 torsions, barriers of EXCEVAL™ demonstrate outstanding performance.

Adding value to your products – worldwide

KURARAY POVAL™, EXCEVAL™, ELVANOL™, and MOWIFLEX™ are the trademarks for polyvinyl alcohol (PVOH) resins made by Kuraray. Their key characteristics — outstanding film-forming properties and high binding strength — add real value to your products. Our polymers are water-soluble, highly reactive, crosslinkable and foamable. They have high pigment binding capacity, protective colloid characteristics and thickening effects. The physical and chemical properties of KURARAY POVAL™ make it ideal for a wide variety of applications, ranging from adhesives through paper and ceramics to packaging films. Many of our polymers are food contact-approved and thus suitable for food applications.

Kuraray produces its wide range of KURARAY POVAL™ grades in Japan, Singapore, Germany and the United States. Kuraray's global production and service network make us your partner of choice for innovative high-quality PVOH resins.



Kuraray Poval™

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