Barrier packaging

Ways to provide barrier properties to a plastic container

From Multilayer Coextrusion to Plasma Fluoridation
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Plastic barrier containers

Plastic barrier containers are created and specifically designed to facilitate the protection of the product they contain and to prevent deformation of the container. The barrier is a key factor for the optimal preservation of the packaged product, especially those that are more susceptible to alterations due to the characteristics of its composition. In particular, plastic containers used to package chemicals containing certain active formulas that can generate gases inside it.

Many factors such as light, humidity, oxygen, temperature and pressure changes are agents that can cause alteration of a packaged product and, consequently, generate the deformation or degradation of the plastic container.

Algunas de las principales propiedades de un envase barrera:

- Resistance to aggressive products contained.
- Waterproofness to solvents.
- Resistance to high temperatures.
- Prevents steam and oxygen permeation.
- UV protection.
The function of the barrier in a plastic container is to protect the contents of all these agents and to ensure that the container remains unchanged. To this end, the plastics industry has carried out a constant evolution of technologies with the aim of ensuring such protection. Two major lines of research in the barrier packaging industry have been multi-layered technology, on the one hand, and surface treatment, on the other. We will give more details below.

Besides, it is important to highlight the fact that a barrier container allows to reduce the total weight of the container and therefore the amount of plastic that is put into circulation. Throughout our activity we have seen, for example, how a product historically packaged in a 120gr monolayer HDPE bottle has needed only 90 gr when changing it to a barrier container made of multilayer coextrusion. A weight reduction has a direct impact on supply chain sustainability.

The choice of type of a barrier packaging will condition the storage and transport characteristics of the product. It is important to know what the market can offer and which of them solutions available is the most suitable for our product.

At Alcion Packaging Solutions we manufacture barrier packaging that provides the necessary technical solution to achieve a single goal:

“**A satisfying consumer experience for the packaging to become what it should be, a product “container” that facilitates its transport, because the important thing, in fact, is what they contain.**”
2. Multi-layer Technology

Multilayer barrier packaging technology consists of the use of polymers with high barrier properties that have the necessary properties for the packaging of each product. These polymers are joined together to get a multi-layered packaging using the process called blown coextrusion, which is just a variant of blown extrusion technology.

Blown coextrusion is the simultaneous extrusion of two or more polymers to get multilayer structure. This technological variant allows to manufacture a multilayer packaging, thanks to the use of several extruders, containing one of them a material that has barrier properties.

Plastic packaging manufactured using this technology in ALCION PACKAGING SOLUTIONS can have 4 to 6 layers, depending on the need for preservation and protection of the contained product. The wide range of multi-layered plastic packaging we manufacture can be customized for each of our customers and it is suitable for our customers’ specific needs depending on the product to be contained.
MULTILAYER COEXTRUSION

The two polymers used in ALCION PACKAGING SOLUTIONS to create the barrier layer of our plastic containers are EVOH (Ethylene-vinyl alcohol) and Polyamide (PA). The efficiency of multilayer plastic containers manufactured by multilayer co-extrusion with Evoh barrier layer, for instance, stands out for using a material that has a high degree of oxygen impermeability, preventing its entry, even in very low thicknesses, thus delaying the oxidation process of the product inside.

It is true that this technology presents an important challenge today since the recyclability of multilayer packaging goes through the chemical decomposition treatment of its layers to separate each of the polymers and materials that make up its multilayer structure. The sustainability of multilayer packaging will depend on how quickly you find the right method for chemical recycling, as, at the moment their cost is high compared to mechanical recycling.
Surface treatment technology

In this process, the barrier properties of the plastic packaging are achieved by treating the surface of the plastic container. We can get a barrier container of high performance from a single layer HDPE or PET plastic one.

DIRECT FLUORINATION

Direct fluorination is a process to which an HDPE or PET single-layer plastic container is subjected to get a fluorinated barrier layer, applying fluoride gas. The barrier is generated in the container by direct exposure of the plastic container to fluoride elemental gas which gives it barrier properties necessary for the type of content to be packaged.

PLASMA FLUORINATION

Plasma Fluorination is a new technology that allows to achieve high barrier in a single layer packaging of HDPE manufactured by blown extrusion.

This innovative technology uses plasma to accelerate the packaging surface coating process by providing barrier properties to packaging that remains 100% recyclable by turning a single-layer HDPE container into a high-engineering barrier container.

Alcion Packaging Solutions is firmly committed to plasma fluorination to solve the problems that direct fluorination had and work on promoting the circular and sustainable economy, true to our commitment to quality, safety, and environmental sustainability.
What is plasma fluorination?

Plasma fluorination is a process in which a thin coat is deposited inside containers. The coating is obtained from a gaseous material and a chamber is used as a microwave source to achieve the energy excitation of the gas.

Plasma-treated surface coating requires that the compound that will form the coating be inserted into the chamber along with the gas that will form the plasma (process gas) and by plasma polymerization ultra-thin layers of the compound will be deposited on the surface of the container.

The coating is done in just a few minutes and the deposited layer is so thin that it does not change the appearance of the container (colour, smell...). During plasma polymerization the substance is sprayed into the process chamber by a “carrier gas”. The basic substance maintains its structure and is attached to the container by physical joints produced by attraction forces and intermolecular forces of Van der Waals (molecular stabilization).
Plasma fluorination barrier packaging applications

Plasma Fluorination can be used to manufacture plastic packaging for agrochemicals, automotive care products, cleaners, degreasers, essential oils, flavours, fuels, insecticides, lubricants, paint thinners, enamels, solvents, toluene, waxes, etc.

Advantages over direct fluorination

Plasma fluorination appears to definitively solve two essential problems of direct fluorination and bring greater environmental benefits.

The first of the problems that are solved by plasma fluorination is related to toxicity, since the fluoride used in direct fluorination is an extremely reactive gas, while plasma fluorination does not use such toxic and environmentally unrespectful gas. The result is a fluorinated plastic container without using gas fluoride to generate the barrier layer.

The other issue that plasma fluorination solves is of vital importance to ensure the comprehensive protection of the product. Direct fluorination could leave small pores or surfaces uncoated, endangering thus the barrier properties of the container. Plasma fluorination resolved such issue, as it allows to reach 100% of the container area evenly.
Recyclability

This new plastic packaging technology, PLASMA FLUORINATION, uses plasma to accelerate the packaging surface coating process by providing barrier properties to a plastic packaging that remains 100% recyclable by turning a single-layer HDPE container into a highly engineered barrier container.

This coating does not affect their chances of being recycled and giving a second use to the material used. Our plasma fluorination treated plastic packaging is recognized for the quality and ability to meet customers’ needs, as well as for the environmental commitment they acquire.

Plasma fluorination packaging is completely environmentally friendly throughout the manufacturing process as in the result itself.

- Allows 100% recyclability of the container
- It is not necessary to separate treated packaging from those that have not been treated for recycling.
- More sustainable supply chain. We try to reduce the weight of the containers to the maximum, decreasing the amount of plastic used for each container. This reduces the cost of packaging, but above all, reduces the cost of transport by achieving a much more sustainable supply chain.
Commitment to safety and sustainability

When choosing a packaging, there are many features to consider. We do not have to forget its elementary functions: to pack, protect, preserve, identify, and inform about the product it contains but always complying with the current legislation.

It is essential is to analyse the interaction **PACKAGED PRODUCT ➔ PACKAGE ➔ ENVIRONMENT** and the effects that occur between them, as well as the physical risks to which it can be subjected during handling, transport, stacking, storage, etc.

The HDPE, transformed in our facilities using **blown extrusion** technology, is itself a material suitable for use as a packaging. Among its features are its lightness, flexibility, and high resistance to impacts. It offers good protection against moisture and water, obviously always depending on the density used. It is easy to hot seal and retains its flexibility at very low temperatures. However, it is permeable to oxygen and has low resistance to fats.

That is why the plastics processing industry has evolved to adopt different alternatives to alleviate the behavioural deficiencies of HDPE’s single-layer packaging.
ALCION PACKAGING SOLUTIONS introduced in 1995 blown co-extrusion technology as an alternative and solution to the collapse of single-layer packaging in the agrochemical sector. The adoption of this new technology allowed us to meet the demands of a growing sector in which worldwide multinational corporations developed their formulations and exported them to countries with very different environmental conditions.

Always attentive to the evolution of the market and society, our mission is based on differentiation in quality, safety, and environmental sustainability. Our R+D+I projects are aimed at manufacturing sustainable and safe packaging. This commitment to the sustainability of our plastic packaging leads us to consider the discredited image of the plastics industry to incorporate into our plant novelties that favour the recyclability of our packaging. Being ISO 14001 certified from the Environment side, we are working to get the ISO 166002 certification of R+D+I that defines the guidelines for the development of policies and objectives in line with the development of products in this field, for the identification of emerging technologies or new technologies not applied in the sector, the assimilation and subsequent transfer of which will form the basis for generating projects, enhancing products or processes and improving competitiveness.

All these premises lead us to introduce plasma fluorination technology in 2020, a new technology that confers barrier properties to our plastic packaging while maintaining its recyclability, convinced of our active contribution to the circular economy.