TRENDS IN FOOD PACKAGING (BARRIER PACKS)

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ABSTRACT

Packaging used for the conservation and marketing of food products has changed greatly over the years in response to economic and social factors, such as the need to avoid food loss and waste, increasing concerns for hygiene, greater demands for natural foods, concern for the environment, and others.

1. Introduction

For each use the most appropriate package must be chosen, depending on a variety of parameters. Aspects such as product characteristics (kind of product, composition, sensitivity to atmospheric conditions, temperature, etc.), expected shelf life, production costs, environmental compatibility, etc., are some of the many questions that must be taken into account when choosing the right kind of packaging and the packaging technology to be used.

Without a doubt, the introduction of **plastics** brought about a revolution in packaging design and production technology. These materials present a series of attractive properties compared to classic glass and metal materials, such as lightness, flexibility, transparency or opacity, thermal resistance, versatility in shape, low cost, thermoforming and joining, possibility of reuse, etc.

But then again, plastic also has its limitations with respect to glass and metal, since standard plastics used until recently permitted the transfer of substances with low-molecular weight, such as oxygen, water, aromas, etc. through the packaging wall.

Here an analysis of the packaging trends related to common materials is done.

2. Discussion

The following graph shows the various polymers commonly used in the food packaging industry and their barrier properties with respect to O_2 and water vapour.

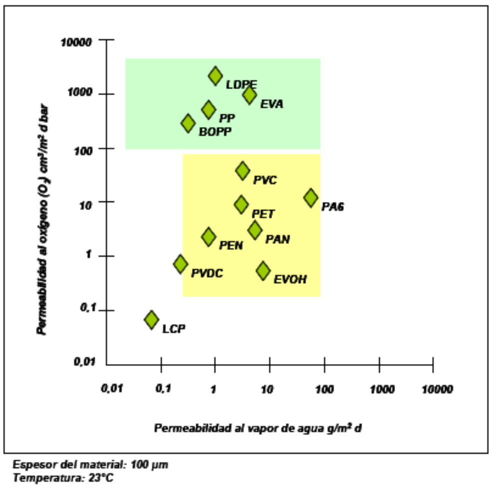

Figure 1: Permeability of several polymers

Some polymers, such as PVC, PET, Nylon, PVdC and EVOH, can be seen to offer a good barrier to gas transfer, but the water vapour barrier is often not good enough for certain applications. Other polymers, such as PE, PP and EVA, offer high water vapour barrier properties, meaning they are good for preventing humid products from transmitting humidity from inside to outside and drying out, or for preventing dry products from attracting humidity from outside. But in contrast, they may present gas permeability levels that are too high to maintain the modified atmosphere inside the packaging.

For these reasons it is often difficult to prescribe a single plastic material that meets all the requirements for food conservation, especially in cases in which a high oxygen barrier is required to **prolong the product's shelf life**. In such cases, the material of choice is usually multilayer packaging. **Multilayer structures** consist of a combination of different plastic materials with complementary properties *(Figure 2)*.

As shown in the graph, **PP/EVOH/PP structures** present a high barrier level to O_2 and water vapour, combined with a wide range of applications at different temperatures, meaning they are **compatible with both pasteurisation and sterilisation techniques.**

In these structures, PP (polypropylene) is used as a structural and sealing material. PP is more rigid and withstands sterilisation temperatures better. EVOH (an ethylene vinyl alcohol copolymer) is the material used as a gas barrier, in this case as the packaging's oxygen barrier.

This is why PP/EVOH/PP structures are increasingly being used, as they offer a highly appropriate alternative to glass or tin packaging, in addition to providing a series of additional advantages: *(FIgure 3)*.

Two alternatives in using PP/EVOH/PP structures are co-injection and In-Mould Labelling (IML) using multilayers.

The co-injection process consists of sequential injections of two different materials using the same entrance orifice. This process is characterised by its capacity to completely encapsulate one injected material inside the other. It is a 3-step process whereby the second material is fully encapsulated by the first *(Figure 4)*

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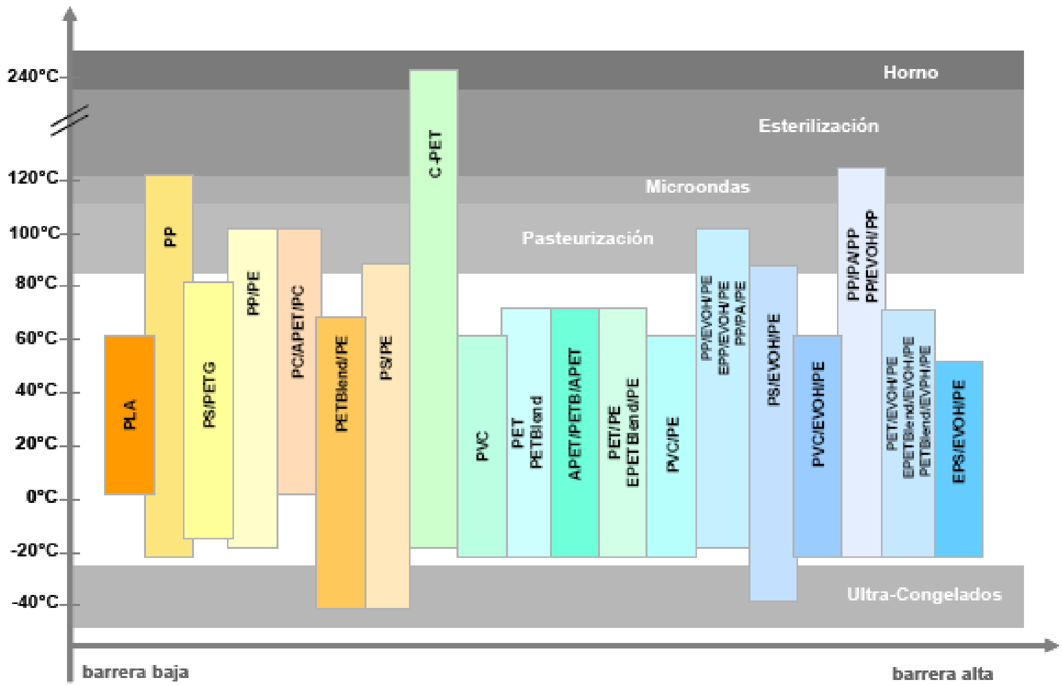

Figure 2: Range of multilayer structure applications

	PP-EVOH-PP	VIDRIO	LATA
Barrera a gases y aromas	●●●●	●●●●●	●●●●●
Barrera al vapor de agua	●●●●●	●●●●●	●●●●●
Resistencia térmica a procesos de llenado en caliente, pasteurización y esterilización	●●●●●	●●●●●	●●●●●
Resistencia a horno microondas	●●●●●	●●●●●	●
Transparencia	●●●●	●●●●●	●
Facilidad de apertura/cierre	●●●●●	●●●	●●
Peso ligero	●●●●●	●	●●
Posibilidad de decoración por impresión, sleever o etiquetado	●●●●●	●●●	●●
Reciclabilidad	●●●●●	●●●●●	●●●●●

Figure 3. Properties of different packaging materials

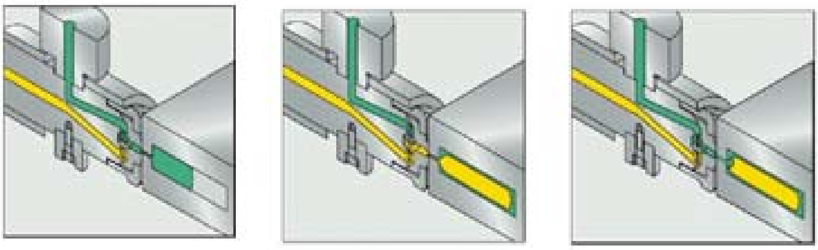

Figure 4: Co-injection process steps.

Figure 5: Multilayer structure of a co-injected package

One barrier packaging option that is now gaining ground is **IML barrier labelling**: IML labelling on injected materials consists of placing plastic material labels in the injection mould itself, in such a way that when the polymer forming the actual packaging is injected over the label, it forms one single labelled pack. This technology was primarily used to provide packages with the maximum amount of decoration over the entire surface, using techniques developed to achieve labels that surround the product completely. Now that multilayer films for IML labelling have been developed, the first IML barrier packaging is now being marketed.

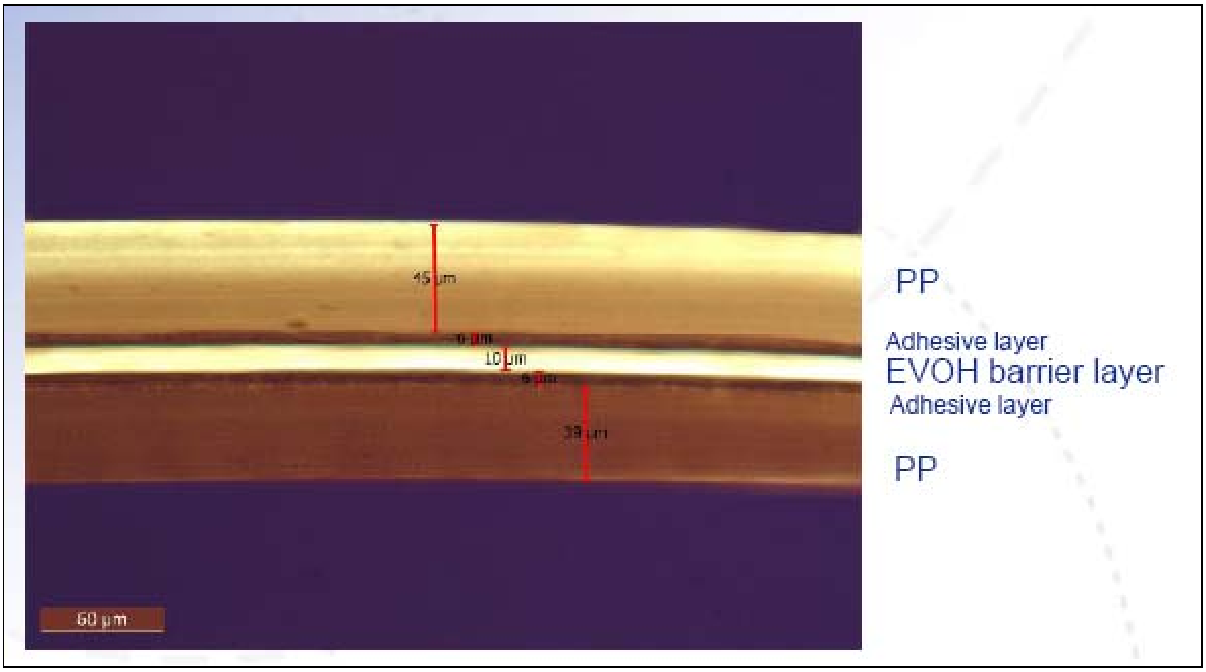

Figura 5: Estructura multicapa de una etiqueta IML barrera.

Figure 7: Results of packaging permeability with and without IML barrier.

Muestra	OTR (cm^3/(envase/día))			
	Celda A	Celda B	Valor medio	Desviación estándar
Envase P950 en PP sin barrera *(11/2084/1)*	0,73	0,76	0,75	0,02
Envase P950 con IML barrera TM00165 *(11/2084/2)*	0,014	0,012	0,013	0,001
Envase P950 con IML barrera GBW80 *(11/2084/3)*	0,00716	0,00727	0,00721	0,00008

Normally in cases where the material used for the package is PP, the labelling film material is PP+EVOH+PP, which results in the same kind of structure achieved for co-injected materials.

Using IML barrier labels for products enables brand owners to make important reductions in oxygen permeability in injection moulded PP packaging, with only a small investment (Figure 7).

3. Conclusions.

If we comparing the characteristics of the options shown here (co-injection and IML barrier) with barrier thermoforming – the option most frequently used to date – we get the following summary:

Tabla 3. Comparación entre tecnologías.

	Termoformado	Coinyección	IML barrera
Obtención de envases en un solo paso	•	•••••	•••••
Baja producción de mermas	•	•••••	•••••
Versatilidad en el diseño de la pieza	•	••••	•••
Uniformidad del espesor del envase	•	•••••	•••••
Libertad en la distribución de espesores	•	•••••	•••
Inversión inicial	•••	•	•••••
Rango de materiales a emplear	••••	••••	••

REFERENCIAS

www.itc-packaging.com