

## Transparent Package and Its Barrier property

**Abstract:** In recent years, transparent package has become a trend. The satisfaction of both transparency and high barrier property of package is not easy. This article elaborates on the reason for the popularization of transparent package, as well as the types and applications of high barrier property material with high grade of transparency.

**Keywords:** transparent package , barrier property , blister packaging , and high grade transparency package

Package material with high grade of transparency has always been in pursuit of many packagers and consumers. It is undoubtedly that the basic methods of consumers are based on genuine material and the real color of products. With the strengthening of package barrier property, materials such as aluminum foil, aluminum plated material and paper molded aluminum are widely used in commercial packages, by which the products have gained excellent protection and longer guarantee period. However, package transparency has been reduced. Transparent package now becomes the trend of fashion because it can satisfy the requirements of transparency and high barrier property simultaneously.

### 1. Transparent Package

One of the principles in package design is adequate demonstration of commodity, which is mainly realized through two ways. The first one is reappearance of commodity with visual and colorful pictures on packages. The other way is the direct demonstration of commodity: using full transparent package or blank package. The most attractive thing of transparent package is its transparency. It can give consumer the opportunity of seeing the content clearly, which accords with the shopping habit that 'seeing is believing'; and therefore, mostly it's welcomed.

Transparent package has wide application fields. Besides bottle and bag package, the following types of packages are generally considered as transparent package: single-sided transparent package with underlying paperboard and bubble cap, partial transparent package with blank, single-sided skin package and double sided clamshell blister package. Plastic and glass are the main material of transparent package.

According to the investigation report 'Blister Package and Its High Grade of Transparency' from American Freedomia cooperation, food has the biggest requirement of high transparency package. This is because American consumers need it to have a direct look at the inner commodity so that they can know the freshness and sanitation of inner food. Medicine and medical treatment products also have great requirements of transparent package with high grade of transparency.

### 2. Material of Transparent Flexible Package

Among the high polymer material used for package, transparent materials are not rare, such as PE, EVA, ionic polymer, PP, PVC, OPS, PT, PET, PA, PAN, PVDC, PVA and EVOH, etc. Polymer materials being commonly used are all with transparency to some extent with the difference in grade of transparency. And different working process

of material will give different influence on finished products. However, as people's understanding of product quality guarantee is becoming deeper, great importance is attached to barrier property (including barrier properties to gas and water vapor) of package material. The using of high barrier property material is one of the effective ways to prolong the guarantee period of some products (such as dairy products, meat food, beverage and juice).

### **3. Barrier property of Transparent Material**

The generally recognized high barrier property materials are PVDC, EVOH and PAN. In aspects of oxygen barrier property, EVOH is better than PVDC and PVDC is better than PAN. While for water vapor barrier property, EVOH is better than PVDC and PVDC is better than PAN. Under conditions of high humidity, barrier property of EVOH will decrease significantly. Barrier property of PAN will also drop greatly with the increase of environment humidity. PVDC is the best in terms of comprehensive property. Generally, PA and PET are considered as high barrier property material. In fact, barrier properties of aluminum foil and aluminum plated film are very excellent. That these materials are less influenced by environment and have a good lightproof function made them once occupies important position in the field of higher barrier property package.

When individually used, high barrier property material will present defects such as expensive in price and sensitive to water. Therefore, it's rarely used alone, and it is always used as one layer of complex film to offer barrier property for this complex film. The protection of other layers will improve its applicability effectively and reduce the cost as well. At present, high barrier property complex film in the market includes three-layer complex, five-layer complex and seven-layer complex. Among them, some use one layer high barrier property material and some adopt multi-layer high barrier property material.

High barrier property materials made of PVDC, PA, EVOH have excellent transparency. Labthink lab has received many high barrier property specimens with excellent transparency. Through large amounts of testing data, we can see that barrier property of material is directly influenced by the thickness and quality of barrier layer of the material. And the structure design of complex film is also a factor influencing the final barrier property. We have once performed gas permeation testing of a kind of complex film with seven layers, the results showed that its gas barrier property is better than common aluminum plated film and can compete with that of aluminum foil. It has high grade of transparency and is better than aluminum foil in aspects of printing, tensile, heat sealing and folding strength. The newly developed silicon coated film abroad made by evaporate SiO<sub>2</sub> and SiO on base material has an excellent barrier property. It is transparent and suitable for package of high temperature steamed food. All that made it the new star of high barrier property materials.

### **4. Applications of Transparent High Barrier Property Material**

Comparing with glass package, plastic package is transparent, light in weight, anti-fragile, portable, flexible in design, convenient to use and low in cost; thus, it is with a bright future. High barrier property complex film is widely used in various packages, such as transparent vacuum package for cold storage meat. Sheet material can be used for various transparent packages, such as capsule blister package. When blown into a container, it can be used to contain products that have high requirement for barrier property in the form of liquid, powder, pasty or block. At present, PET container has the best barrier property among plastic containers. With excellent oxygen

barrier property and good defilade property against ultraviolet ray, PET has successfully replaced glass package in the field of milk, beverage and juice package. And by blending with PEN, surface coating and multi-layer complex, its barrier property can meet the package requirement of beer. Now, PET has found certain application in beer package of domestic and foreign market as well.