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Packing Functions and Testing of High Polymer Materials

Abstract: This article elaborates on the operation characteristics and functions of flexible package materials.
Keywords: high polymer , flexible package , physical property , chemical property

The application of high polymer materials has eked out the shortage of previous packages in terms of heaviness, complexity and single function, resulting in the wide applications in industries of food, pharmaceutical and etc. Moreover, the customer-made nature of high polymer materials makes it possible to design the packing structure according to characteristics of inner content and intentions of designers. Relevant documents show that, at present, domestic plastic packing (including vessel, tool) occupies approximately 30% of food packing in an escalation trend, with its growth faster than that of paper food packing. Although domestic regulations on the quality of package material have been strengthened in recent years, food packing has hidden trouble in its safety and problems in packing quality. Therefore, from this year on, our country starts carrying out the compulsory authentication of food package/containers so as to further guarantee the quality of plastic packages.

1. packing functions and testing demands

Basic functions of modern package cover the three aspects of protection, convenience and promotion. Before arriving in the hands of consumer, a packing-finished product must go through a process of loading and unloading, transportation, storage and exhibition, etc, where many possible destruction factors to inner content exist in each of the links and where the protective function of the packing is demonstrated to prevent the damage created in terms of quantity and quality of products. The convenient function refers to filling, transportation, loading and unloading, piling and opening, etc, which have certain demands on properties of packing materials. For instance, to facilitate opening and consuming, mechanical property of materials is required. Promoting function of the packing is realized mainly through decorative design and shape design with reasonable and delightful color, pattern, and model. This relies on, to a great extent, the shape, the color, the texture, the transparency, the glossiness, the printing compatible and so on.

To food package, especially to flexible package, plastic films should possess some physical and chemical properties on the premise of the above-mentioned functions. Generally, the physical property mainly includes mechanical property, thermal behavior, optical property and barrier property, which can be called routine physical property if barrier property is excluded. The chemical property indexes refer to evaporation residue, potassium permanganate consumption, heavy metal content and organic solvent residue quantity and need to be tested with chemical agent or gas chromatography. This article will focus on routine physical property tests of materials.

2. Routine Physical Property Test of Packing Materials

Being the basis of quality guarantee, routine physical property test is to avoid package breakage before the predetermined packing functions of products are fulfilled. Package breakage under this occasion will result in the failure of all protective functions of packing materials, even if special functional materials or materials with better

chemical property are adopted. The routine test includes mechanical property test, thermal property test, and optical property test. Moreover, specific application occasions have specific demands on combustibility, electrical property, and dielectric resistance. Therefore, test items of materials should be decided according to the required application of package.

As for general flexible package manufacturers, the demand on mechanical property test of materials is the strictest. It includes the stretch performance, the curving performance, the impact performance, the cutting performance, the friction performance and the heat-seal performance, etc. Any unqualified item may result in package breakage or failure of production operation. For instance, heat-sealability of material includes two aspects: hot tack tested while the sealing part is still hotter (not cooled down to atmospheric temperature) and ultimate strength tested after the sealing part is cooled to a stable state. Heat-sealing package is widely used in the fields of daily chemical products, food and medicine. The filling process is normally finished by dropping products into package from a certain height, which has strong impact on the package bottom. If the package bottom cannot resist the disruptive force of filling content, there will be cracked package. In order to effectively control the rate of failure package, hot tack (tested when the heat-sealing layer (sealant) is not completely cooled down) enjoys greater concern. The majority of packing products are piled up during transportation. If inner content is liquid or air-regulated packing form is adopted, package breakage will happen when the ultimate strength of package is unable to endure external pressure. That is why there are certain requirements of heatsealability of sealing part after being completely cooled down.

Thermal performance includes thermal stability, linear expansibility and low temperature test, etc. Among those, thermal stability and low temperature test attract the most attention of flexible packing industry. Thermal contraction of material is one of the indexes of thermal property, which later become one of the important test items of contractile film. Optical property is also one important index especially in packing light-sensitive food. Its test items mainly include luminousness and fog density.

3.Influencing Factors of the Test

Basically, routine physical test items can be carried out with corresponding test instruments. For one test item, there maybe more than one test method. Moreover, the test environment, the specimen dimension as well as the pretreatment will influence test results. Comprehensively speaking, the main influencing factors are test environment, pretreatment and test method adopted.

Test environment can impose direct influence on the result. For example, different temperature will result in significant changes of friction coefficient. The humidity can also influence some polymers, especially the high polarized polymers.

Both time and conditions of pretreatment will affect test results, which mainly results from the unconformity of specimen manufacture environment and incomplete elimination of internal stress. Test comparison should be performed under the same pretreatment environment and the pretreatment time.

There is no comparability between test results obtained with different methods. Property comparison of materials should be carried out on the premise of the same test condition (environmental humidity and test speed). To domestic flexible package industry, it is an effective way to improve data comparability by purchasing test

instrument that completely conforms to national standard.

4. Labthink Routine Lab

Labthink Routine Lab mainly deals with the business of providing routine physical property test to customers and introducing Labthink routine test instruments. This lab is furnished with the self-developed instruments, such as mechanical property test instruments, thermal property test instruments, optical property test instruments and ink quality test instruments, for the routine property testing of flexible materials. To help flexible package manufacturers to judge whether the properties of materials can satisfy the application requirements, the lab provides comprehensive evaluation of material properties. Test instruments in Labthink routine lab can carry out all the routine physical property tests (barrier property test is excluded and it can be completed in Labthink Barrier Property Lab) of materials required in national standards. It can offer complete test service for food manufacturers and relevant suppliers in passing 3C authentication.