

Super Detailed Introduction of the Main Components of the Adhesive

Detail Introduction :

Super detailed introduction of the main components of the adhesive

Super detailed introduction of the main components of the adhesive

The composition of adhesives varies greatly depending on the source and use of the raw materials. The design of natural bonds is relatively simple, primarily one-component; Simultaneously, synthetic adhesives are more complex than the essential bonding substances. To meet the specific use function, it is necessary to add various compounding agents. For example, to accelerate curing, shorten bonding time, and reduce reaction temperature, catalysts, accelerators, etc. can be added; adding antioxidants can improve resistance to atmospheric aging, thermal aging, ozone aging, etc.; adding fillers can not only increase strength but also reduce The addition of plasticizer or toughening agent can reduce the rigidity of the adhesive layer and increase the toughness; the addition of diluent can reduce the viscosity and improve the construction performance.

Generally speaking, adhesives include primary materials, auxiliary materials, and auxiliaries. The main materials are mainly adhesive (rubber) and curing agents. The adhesive can play a general bonding role with these two kinds of raw materials. Of course, some adhesives can be fixed without a curing agent under certain external conditions, such as elevated temperature. Excipients and auxiliaries mainly include accelerators, toughening agents, plasticizers, thickeners, diluents, antioxidants, polymerization inhibitors, coupling agents, initiators, photosensitizers, defoaming agents, preservatives, fillers agents, solvents, etc. Except for the rubber compound, which is essential, the rest of the components depend on specific requirements.

main ingredient

(1) Rubber compound

The glue, also known as the base material or the adhesive, is a component that plays a significant role in combining two adherents, and it determines the basic properties of the adhesive. The sizing materials that can be used as adhesives include natural polymer compounds, modified natural polymer compounds, synthetic polymer compounds, organic compounds, inorganic compounds, etc.

?Natural polymer compounds The natural polymer compounds that can be used to formulate adhesives include Starch, dextrin, peach gum, gum arabic, bone glue, skin glue, gelatin, fish glue, shellac, vegetable protein, casein, blood meal, rosin , asphalt, natural rubber, etc.

?Modified natural polymer compounds Some natural polymer compounds can be used as adhesives after proper chemical modification, such as nitrocellulose, cellulose acetate, carboxymethyl cellulose, rosin phenolic resin, modified Starch, chlorinated rubber, etc.

?Synthetic polymer compounds Synthetic polymer compounds are the best-performing and most-used sizing materials among adhesives, including synthetic resins, synthetic rubbers, thermoplastic elastomers, etc.

?Organic compounds The main components of some synthetic adhesives are not high molecular compounds or prepolymers, but low molecular organic compounds (or monomers), but the final products are high molecular compounds, instant adhesives and Oxygen adhesives fall into this category.

?Inorganic compounds Inorganic compounds such as silicates, nitrates, borates, phosphates, magnesium oxide, and zinc oxide can be used to formulate inorganic adhesives, which have unique high-temperature resistance properties. (2) curing agent

For some types of adhesives, the curing agent has an important influence on the performance of the bond, which should be determined according to the kind of adhesive in the cement, the performance

requirements of the adhesive parts, specific process methods, environmental protection issues, health hazards and price to choose the ideal curing agent.

Curing agent, also known as hardener and curing agent, is the most critical compounding material in adhesives. It reacts with the host polymer directly or through a catalyst. It can convert a soluble and fusible linear structure polymer compound into an insoluble and infusible body structure in a relatively short time. At the same time, the curing agent participates in the chemical reaction. Become part of the cured product. The introduction of the curing agent molecules significantly changed the intermolecular distance, morphology, thermal stability, chemical stability, etc. Some resins such as epoxy resin, urea-formaldehyde resin, and other curing agents are indispensable.

Excipients and Auxiliaries

(1) Accelerator

Any substance that can speed up the curing reaction rate of the adhesive can be called an accelerator. The addition of the accelerator can accelerate the reaction between the host polymer and the curing agent in the sticky, shorten the curing time, reduce the curing temperature, reduce the amount of the curing agent and adjust the curing rate of the resin in the adhesive. At the same time, the addition of accelerators can also improve the physical and mechanical properties. For example, DMP-30 can cure epoxy-polysulfide-low molecular weight polyamide adhesive even below 15°C; 2-ethyl-4-methylimidazole can reduce the temperature of dicyandiamide curing epoxy resin.

(2) Plasticizers and tougheners

?Plasticizer

Plasticizers are a class of high-boiling, hardly volatile liquids or low-melting solids that can increase the fluidity of the adhesive and make the film flexible. The plasticizer has low viscosity and a high boiling point, which can increase the fluidity of the resin, which is beneficial to infiltration, diffusion, and adsorption. Plasticizers generally do not chemically react with the main components of the adhesive. They can be considered an inert resinous or monomeric "filler" that segregates from the system during the curing process by weakening the polymer. The physical effect of intermolecular force reduces brittleness and increases toughness, but the adhesive film's rigidity, strength, and thermal deformation temperature will decrease. The components of the plasticizer and adhesive must have good compatibility to ensure the stable and durable performance of the bond. Commonly used plasticizers are dimethyl phthalate, diethyl phthalate, dibutyl phthalate, dipentyl phthalate, dioctyl phthalate, triethyl phosphate ester, tributyl phosphate, etc.

?Toughening agent

The toughening agent is a compound that contains active groups and can interact with resin. It can react with sizing material to become part of the curing system, but it is not entirely compatible after curing and sometimes even separates phases. Toughening agents can improve the shear strength, peel strength, low-temperature performance, and flexibility of adhesives. The active group of the toughening agent directly participates in the rubber compound reaction, which can not only improve the brittleness, cracking, and other defects of the adhesive without affecting the main properties of the adhesive but also improve the impact strength and elongation of the adhesive. For example, carboxyl-terminated liquid nitrile rubber (CTBN) is an excellent toughening agent for epoxy resins. The peel strength of the epoxy resin-CTBN system after curing at 120 °C is 4.4-13.2kN/m, and the shear strength is 27-41MPa. Commonly used toughening agents are as follows: unsaturated polyester resin, polysulfide rubber, nitrile rubber, liquid nitrile rubber, neoprene, polyurethane, etc.

(3) Diluent and solvent

? Thinner

Thinners are free-flowing liquids that reduce the viscosity of adhesives. Adding a diluent can make the glue have good penetrating power, improve the wettability, improve the processability of the bond, reduce the activity of the bond, and prolong the service life of the bond. Diluents are roughly divided into two categories, namely reactive diluents that can participate in the curing reaction and volatile or non-volatile non-reactive diluents that only physically mix. The molecule of the reactive diluent contains active groups. It engages in diluting the adhesive and gas escapes, which can improve some adhesive properties. Reactive diluents are primarily used in epoxy resin adhesives, and other

types of adhesives are used less. The non-reactive diluent does not participate in the reaction during the dilution process and only achieves the purpose of mechanical mixing and viscosity reduction. After adding the diluent, more fillers can be added to change the adhesive properties and also reduce the cost.

?Solvent

It refers to the liquid that can reduce the intermolecular force of some solid or liquid and disperse the dissolved substance into molecules or ions. It is an indispensable component of solvent-based adhesives. General organic solvents have certain toxicity, flammability, and explosion, which pollute the environment and have hidden dangers to safety. Therefore, solvent-based adhesives are gradually limited. Solvents are used more in rubber adhesives and are rarely used in other adhesives. Its effect is basically the same as that of a non-reactive diluent but differs in the degree of dilution. When different solvents are added to the adhesive, the viscosity of the adhesive is different, and the physical properties are also different.

(4) Packing

Filler is one of the important compounding agents of adhesives, which plays a very important role in improving the performance of adhesives and reducing the cost of products. With reinforcement, thickening, compatibilization, flame retardant, wear resistance, increase hardness, reduce shrinkage, reduce thermal expansion coefficient, increase thermal conductivity, electrical conductivity, thixotropy, improve water resistance, heat resistance, aging resistance, Extend the validity period and other functions. In general, fillers do not chemically react with components such as sizing materials and curing agents, and their main functions are as follows.

?Improve mechanical properties

Commonly used fillers, such as metal powders and metal oxides, can improve the compressive strength and dimensional stability of the adhesive and reduce the shrinkage rate. But it will also reduce some properties of the adhesive, such as peel strength. Adding carbon black, white carbon black, calcium carbonate, etc., to the rubber can improve the tensile strength, hardness, and wear resistance. ?Give the adhesive a new functional adhesive to add the silver powder to make conductive adhesive; use carbonyl iron powder to make magnetic conductive adhesive; use copper and aluminum powder as filler to improve the thermal conductivity of the adhesive; add chromium to epoxy resin Zinc acid can improve the retention rate of strength. Adding 50% antimony trioxide to the filler can enhance the resistance to oxidative damage; adding Zr (SiO_3), two can reduce the water absorption of epoxy resin; adding fumed SiO_2 can improve the adhesion. The thixotropy of the agent improves the process performance.

?Reduce joint stress

The curing reaction is often an exothermic reaction, and the filler can prevent local overheating; in most cases, curing shrinkage occurs during the bonding process, and the filler can adjust the shrinkage—excessive penetration into the wood results in a lack of glue and glue penetration.

?Improve the operation process The adhesive can obtain thixotropy through the thickening of the filler, which can adjust the curing rate, prolong the service life, and facilitate the operation and construction. The amount of filler should be appropriate, not only to provide the corresponding function but also to ensure the overall superiority of the adhesive formulation. In the dispensing formula, the filler will increase the viscosity of the adhesive, making it difficult to operate, unevenly mixing the glue, and worsening the wettability of the adhesive and the adherend, resulting in a decrease in the bonding strength.

(5) Coupling agent

In the bonding process, in order to form a firm interface layer between the adhesive and the surface of the adherend, the materials that cannot be directly bonded or are difficult to bond can pass through this interface layer to make the bonding force. To improve, the composition of this interface layer is called a coupling agent.

(6) Other additives

In order to meet some special requirements and improve a certain characteristic of the adhesive, some specific additives are sometimes added. Add the anti-aging agent to improve atmospheric

aging resistance; add an anti-mildew agent to prevent bacterial mildew; add tackifier to increase the adhesion and viscosity of glue; add polymerization inhibitor to improve the storage of glue; add flame retardant In order to make the adhesive layer not easy to burn and improve the flame resistance of the bonded products. They have no required components and depend on the properties of the main ingredient of the formulation and the requirements of the adhesive.

Related articles:

Several common types of water-based adhesives