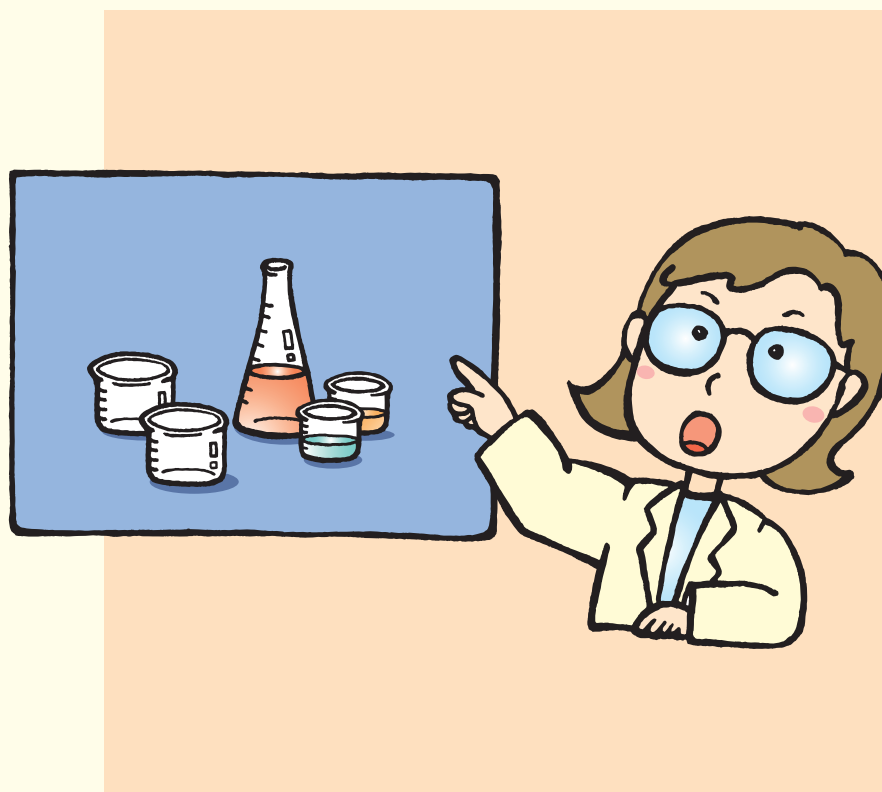


General Characteristics and Handling of Liquid Chemical Products



ThreeBond Product Safety Guide No. 1

General Characteristics and Handling of Liquid Chemical Products

ThreeBond products are widely used in numerous industrial fields. Most of the products are high polymer chemical products which are synthetic resins before use or liquids mixed with other materials. Depending on the conditions prescribed for use, the products change into a solid or elastic body to provide adhesive, sealant or protective properties. However, safety measures are required, because they are chemical products. Special caution is also needed when handling these products, because they are designed to change from a liquid to a solid. Each individual product has its own particular handling precautions, but this document organizes the common aspects of the many ThreeBond products under the general characteristics of chemical products.

Please read this guide in order to use ThreeBond liquid chemical products *safely and correctly*.

Health Effects and Dangers

(1) Vaporized ingredients are harmful.

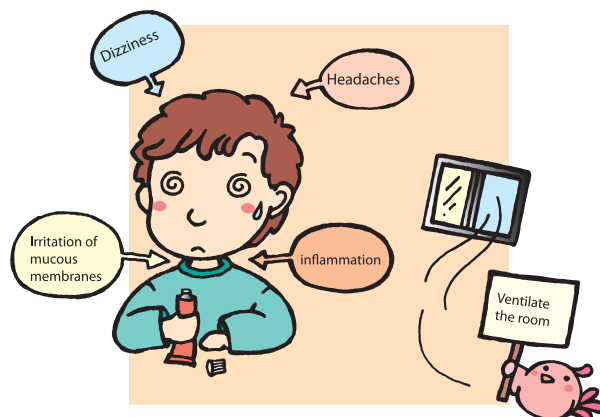
Most adhesives and sealants contain organic solvents. Inhaling vaporized organic solvents may cause poisoning. Though extent of toxicity differs, most organic solvents are toxic and when inhaled can cause irritation of mucous membranes, inflammation, headaches, and dizziness.

Please use proper ventilation when using products which contain organic solvents.

(2) Some people may experience contact dermatitis.

The development of contact dermatitis is a medical and physiological phenomenon with a wide degree of individual variance that makes it difficult to treat. The PII value (primary irritation index) is an index which indicates the degree of irritation. While we refer to this index when developing products, it is difficult to eliminate irritation. It is better to acknowledge that chemical substances can cause irritation and to handle them with care so as not to cause any irritation.

Some products may trigger contact dermatitis (sensitivity), even if the PII value is low, and cause a rash after handling them several times. In addition, the effects vary greatly depending on the individual. If you are sensitive to irritation, it is best that you not handle chemical products as much as possible. However, if you must handle such products, please use safety glasses and gloves in a location with a nearby ventilation device. Furthermore, if any abnormality is found, immediately stop using the product, and seek medical attention.



(3) Use of products for special purposes, such as medical and food grade manufacturing.

Our products have been developed for general industrial purposes. We have not verified the safety of these products for any special use such as with medical devices or parts which come into contact with food. If you intend to use them for such purposes, please conduct appropriate preliminary tests for the usage to verify the safety.

In addition, they should never be used in medical implant products.

(4) Products may have an odor.

Chemical substances are not odorless and tasteless. They do emit some odor. The type and strength of the odor varies. When designing products, we try to include ingredients which have little odor, but in some cases we may have no option but to use an ingredient with a strong odor due to the product characteristics.

(5) Some products may chemically react when heated.

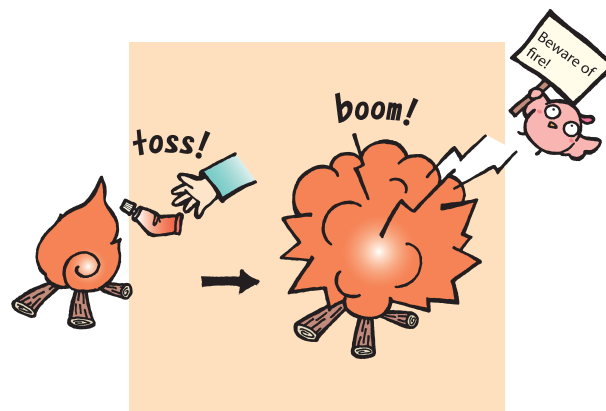
Instant adhesives, two-part liquid epoxy resins, and acrylic resins heat up during the curing reaction. In some cases, the heating is enough to cause *burns*, so please exercise proper caution. In particular, a large mixture of two-part liquid epoxy resins can cause smoke, which is extremely dangerous. Please exercise proper caution when handling.

(6) Most products are combustible.

Many adhesives and sealants are combustible. In particular, organic solvents are highly combustible, which makes products that contain significant amounts of them also highly combustible, so please be careful of fire.

(7) Disposal precautions

Please dispose of adhesives and sealants using the prescribed methods. Some products may emit toxic gas, quickly combust, explode or cause a disaster when exposed to fire. Discarding these products in wastewater or underground causes environmental pollution. Ask a waste management professional who is authorized by your local government to dispose of such materials.



Please refer to the Safety Data Sheet (SDS) issued by ThreeBond which describes the precautions when handling products.

■ Precautions for Usage and Storage

(1) A fluid with a viscosity that is not strictly constant.

Most adhesives and sealants are liquids, but the viscosity or flow rate of those products is not necessarily constant. Products are managed at a constant, standard value during manufacturing and shipping, but the following factors (2) can cause the viscosity to increase and the flow rate to change. This behavior is unavoidable in chemical substances.

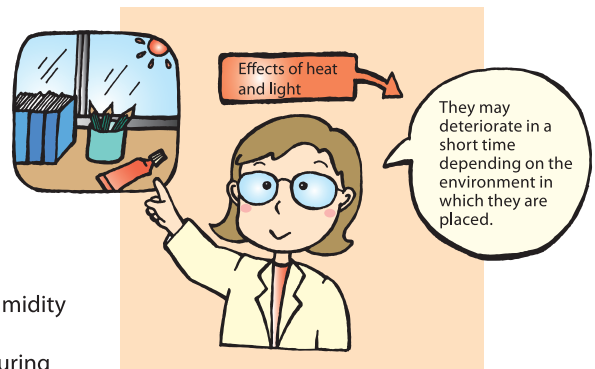
The viscosity of an adhesive or sealant can be extremely sensitive to temperature. If the temperature decreases by 10°C, the viscosity increases by two to three times (up to five times depending on the temperature range and the type of resin). If the temperature is not kept constant, the viscosity will vary greatly between the summer and winter even for the same product.

When using an automatic dispenser, be sure it is used in an environment with a constant temperature to maintain a consistent viscosity.

(2) Chemical substances deteriorate easily and have a comparatively short warranty period. (change over time)

1. Exposure to heat and light

Generally, chemical substances are sensitive to exposure to heat and light, and can quickly deteriorate depending on the environment in which they are placed, losing their original properties. Many adhesives and sealants are sensitive to heat and light because they are composed of chemical substances. Our products come with storage temperature requirements and a quality assurance period. Please observe the storage temperature requirements after purchasing and use up the product within the quality assurance period.



2. Exposure to humidity (moisture)

Some types of adhesives and sealants undergo a curing reaction from to humidity (moisture). Products such as instant adhesives, silicone sealants, and some UV-curable resins may react over time with external moisture and harden during storage even if they are in a sealed container. Please tightly seal the product after use and use the remaining portion as soon as possible.

3. Effects of low temperature

Some adhesives and sealants may freeze, crystallize or separate due to low winter temperatures or refrigerated storage (freezer). In particular, there is a risk that water-based and emulsion types may freeze and separate. Please follow the displayed precautions when storing such products.

4. Effects of metal

The properties of anaerobic sealing agents cause them to undergo a curing reaction when they come into contact with metal or are sealed off from the air. Placing this kind of adhesive into a metal container and then using it or bringing it into contact with metal and then returning the used liquid to the container causes the entire container to cure. To avoid the possibility of introducing foreign substances, do not change containers or return unused adhesive back to the original container.

(3) Easily affected by other chemical substances.

Chemical substances may be affected by other chemical substances. For example, instant adhesives may gel and cure when stored in the same location with alkaline substances. Please do not store instant adhesives in the same location with curing accelerators or epoxy resin curing agents.

(4) The performance changes depending on the material used, surface conditions, and gaps.

1. Materials

When using a solvent-vaporization adhesive on an adherend made of a permeable material such as wood or paper, the solvent contained in the adhesive vaporizes in a comparatively short time to display its adhesive properties. But it takes time for the solvent to vaporize on the bonding surface when used on a non-permeable material such as metal or plastic. Depending on the bonding surface area, the coating amount, and the drying time for bonding, it can require a week or more.

2. Surface conditions

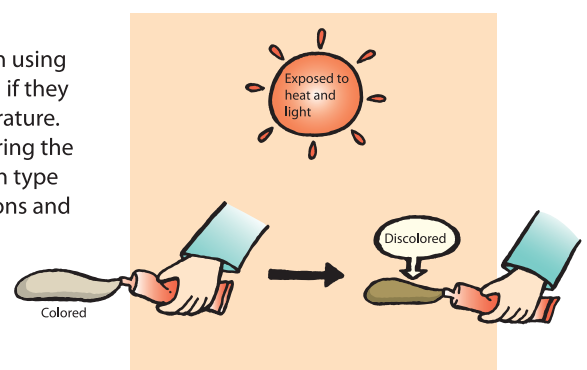
The surface conditions greatly influence the adhesive properties when conducting adhesive bonding. Please remove any foreign substances such as moisture, oils, rust, or dust from the surface before use.

3. Gaps

Anaerobic sealing agents are designed to start curing when the adhesive is sealed off from the air. Therefore, if there are large gaps around screws or joints, then the air seal will be insufficient and cause the curing to take too long or lack strength after curing.

(5) It can be difficult to ascertain the curing status.

In many cases, it is difficult to tell how far the curing process has progressed when using adhesives. In particular, with reaction adhesives it is difficult to tell just by looking if they are still curing or already finished. Chemical reactions are very sensitive to temperature. An adhesive that cures in one day during the summer might take over a week during the winter or not cure at all. One method to confirm the curing condition of a reaction type of resin is to set aside a portion of the resin used under the same (curing) conditions and then periodically perform a visual check of the curing progress.



(6) Products may become discolored.

Many adhesives and sealants are colored. The color may come from the resin ingredients or be the result of dyes and pigments. Those coloring substances chemically change over time due to the effects of heat and light, causing a change in color to appear. The degree of color change depends on the substance as well as the storage conditions.

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