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Mixing & Handling Instructions for Epoxy Adhesives and Casting Compounds

Mixing Introduction:

It is often said that mixing epoxies is like baking a cake. Everything has to get mixed well or it's not a cake. Two part epoxy compounds are normally supplied in an A - B mix or kit. The Part A is the resin side and the Part B is the hardener. Epoxy resins are normally clear to slightly amber, high viscosity liquids which may be filled with metallic or mineral fillers to improve performance and lower cost. These sometimes settle to the bottom of the container and must be brought up into the mix before adding the hardener. Depending on the molecular weight of the resins or mixture of resins, the Part A can be very low viscosity or it can be so highly viscous that they must be melted before use. Epoxy resins can cause mild skin irritation and a form of dermatitis upon repeated contact. It is important to limit skin contact with any epoxy resin or hardener. Therefore, we recommend that you wear rubber gloves when mixing and using the epoxy compounds.

Resins:

The part A, the resin, in some cases may be susceptible to crystallization during long periods of storage when a constant storage temperature is not maintained. It is recommended that materials be stored at room temperature at all time, and avoid storing on concrete floors, as the ground temperature may fluctuate greatly between night and day. If crystallization occurs, it appears as if the material is frozen or granular. If you notice this in your product, contact the company to receive further instructions.

Hardeners:

The part B, the hardener, is typically an amine or mixture of amines. The amine is a cousin to the ammonia family and has a strong ammonia-like smell. The hardener, like the resin, can be filled with metal or mineral fillers to improve performance or lower costs. And just like the resin, these fillers may settle over time and must be brought up into the solution before mixing with the resin. Some epoxy hardeners are based on anhydrides rather than amines. These hardeners are more likely used in electrical potting and encapsulation applications and are likely to be heat cured in nature.

Surface Preparation:

If the surfaces that you intend to adhere together are not prepared properly, the best adhesive in the world will not hold them together. The major problems in adhesive delamination are dirt and oil. Whenever possible, the surfaces to be adhered should be abraded with sand paper or by sand or shot blasting before the adhesive is applied. Oil on the surface of steel or even oil from fingerprints can ruin a bond. If the surface to be bonded is painted, the bond of the paint to the substrate will be a limiting factor in the overall bond quality. Plastic surfaces should be abraded and when possible flame treated or corona treated to remove any plasticizer from the surface and provide an oxygen rich surface environment for the adhesive. Please call the technical service department at Star Technology for an explanation of how to flame or corona treat your plastic parts.

Mixing:

When hand mixing the epoxy resins and the hardeners, it is best to pour the resin, the Part A, into the mixing vessel first. The product should be weighed to the nearest gram or to the nearest 0.5%, whichever is more precise. Next, the Part B is added using the same weighing procedure. Mix the two components using a stir stick or a paint mixer in a drill or drill press. Mix the product for at least 3 minutes by the clock...scraping the sides and bottom of the mix vessel frequently. [Remember, it's just like baking a cake!] After the products have been thoroughly mixed, the mixture should be poured into the mold or used in the adhesive application. Often, the end product must be totally free of voids and bubbles. If this is the case, the mix must be vacuumed before being poured into the mold. This is done by putting the mix vessel into a vacuum chamber and pulling a vacuum of at least 28" Hg. This will usually degas the product within 5 minutes. The reaction mixture will bubble and froth. You should have a mix container at least 4 times the volume of the liquid in the container for vacuum degassing. Therefore, 1 quart of the liquid product will require a 1 gallon bucket to degas the mixture. If you intend to vacuum degas a product, make sure that you tell Star Technology about your wishes. We will need to formulate to product with a delayed gel time and extra air release additives to allow sufficient time to accomplish the process.

Reaction Rates:

Now is probably a good time to talk about the reaction rate of the mixture and what affects it. Reaction rates are usually stated at a certain temperature and at a certain mass of material [e.g.: 25 minutes in a 100 gram mass]. If you are working with a larger mass, the reaction time will be shorter. Lower masses and thin films will be much longer. If the reaction starting temperature is higher, the reaction rate will be faster. A rule of thumb is that for every 10 degrees C that you increase the temperature of the reactants, the reaction rate will double [the gel time will be cut in half]. That is why larger masses will react more quickly than small masses. As the reaction proceeds, it generates its own heat. The heat builds up inside the mixing vessel and the reaction goes faster, which makes more heat, which makes the reaction go even faster.....

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Molds and Mold Releases:

If it is your intention to mold epoxy, the first thing that you need is a mold! Molds are often made from RTV silicones. The surface of an RTV mold is covered with reactive sites which will bond like gangbusters to your epoxy casting. To overcome this problem, you can make the mold out of something else, like urethane or you can use a mold release, which you would need to use in any case.

There are a plethora of mold releases out there on the market. We have found that the non-silicone containing versions work best. If you use a spray mold release, it is important to "cure" the mold before using it for the first time. This is done by spraying an excess of the mold release on both the inside and outside of the mold, placing the mold in an oven and baking the mold for some length of time. [Be careful when using flammable mold releases in an oven.] This process will thin the mold release and make it flow into the pores of the mold, thus sealing the mold. Remove the mold from the oven, wipe out all of the excess mold release and give the mold a very thin coat of mold release. When it comes to mold releases, less is best. Too much mold release will cause bubbling over the surface of the molded part and will ruin your casting. Often, mold releases must be baked to insure that all of the solvent is removed from the release before the part is poured.

We have found that Johnson's Paste Furniture Wax is an excellent mold release. The wax can be wiped on a warm mold to provide an excellent barrier between the mold and the casting. It can also be mixed with mineral spirits to provide a sprayable release.

Handling

Introduction:

Even though epoxy systems can be hazardous, you can protect yourself just by using simple precautions. Everyone handling epoxies must be properly trained to work safely. Workers should handle epoxy resins and hardeners like any other chemical product, with care. Epoxy chemicals can cause eye and skin irritation, and they are sensitizers. Some people may develop skin sensitivity similar to poison ivy after repeated contact with epoxy compounds. When used in sprays, epoxy compounds can be irritating to the eyes and irritating to the lungs if inhaled. Mixing epoxy chemicals may generate heat, and with certain systems, can even cause smoke.

When Handling Epoxies, do:

- Make sure you have received complete training.
- Refer to MSDS' s for all your products and review all safe handling information.
- Select and wear the proper glove for your operation. Not all gloves provide adequate protection.
- Wear clean protective clothing, covering all exposed skin.
- Use protective skin creams only as supplements to, not replacements for, gloves.
- Be sure there is adequate fresh air ventilation, especially when working in confined areas.
- Practice good housekeeping and personal cleanliness at all times.
- Do not allow contaminated clothing to remain in contact with your skin.
- Change contaminated clothing right away.
- Keep tools and clothes clean. Do not wear or reuse contaminated articles.
- Follow proper procedures to dispose of empty drums and containers. Do not reuse.
- Read container labels for special instructions.

If spraying epoxies, do:

- Use full-face, air-supplied respirators when spraying.
- Wear air-supplied chemical suits when spraying in confined areas or where mists could be present
- Keep tools and clothes clean. Do not wear or reuse contaminated articles.

After handling epoxies, do:

- Wash thoroughly before eating, smoking, using the toilet, or taking a break and after work.
- Remove protective equipment carefully to avoid contacting you skin.
- Should any material come in contact with your skin, wash with soap and water, not solvent.
- Change clothing immediately if epoxies spill onto clothing. Launder contaminated clothing before reuse.
- Watch out for contamination inside work gloves and on tools. Clean tools before reuse.

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