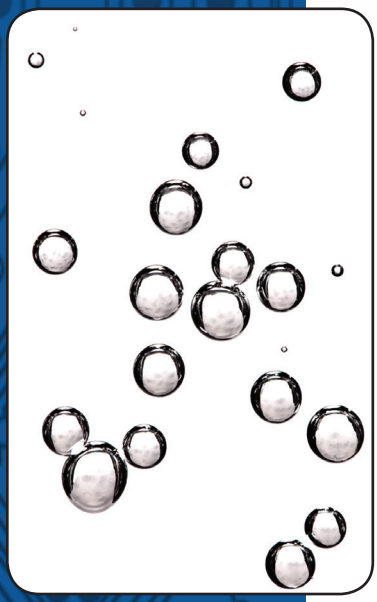
Tech Tip 4

Removing Bubbles from Epoxy

What > Removing Bubbles from Epoxy

Why > Removing bubbles ensures optimal adhesive performance by providing a good continuous bond.



Air entrapment is an inevitable occurrence when any product, regardless of its rheology, is mixed. This tip discusses three techniques for removing and reducing this entrapped air.

Pre-mixed and frozen syringes are a convenient way to apply adhesive and can assist in reducing any potential errors that can occur when weighing out each component on a gram scale and hand mixing.
Occasionally, there may be a small amount of air entrapped within the syringe after it has been packaged. Air can also become entrapped within a hand mix of material in an open container. The following are three simple ways to remove bubbles from epoxy before applying it to your parts: Vacuum Degas, Centrifuge, and Heat.

Vacuum Degas:

Vacuum degassing involves actual removal of the air surrounding the epoxy by allowing the air that is trapped within the epoxy to easily escape. In order to accomplish this, the epoxy should be placed into a container that has at least five times as much volume capacity as the epoxy itself. This is due to the "rise" in the volume of epoxy once the material is subjected to the vacuum.

The vacuum should be created with a pump that can pull at least 29 inches of Hg quickly. The key is to hold the vacuum for as short a period of time as possible without pulling too much vacuum. An indication of this is a "rolling boil" which will have the opposite affect and actually adds bubbles to the epoxy. Vibration can also assist in facilitating the bubbles while pulling the vacuum.

This method is used for epoxy that is in an open container only.

Centrifuge:

This is the most commonly used process for removing bubbles in syringes. Once the product is placed into a syringe with the piston, the syringe should be stood up with the tip up on a lab bench to allow any air bubbles to push their way up to the syringe tip. As soon as the bubbles have moved up to the syringe tip, the luer lock tip cap should be removed. The piston can then be pushed up slowly to remove any large bubbles present in the syringe out through the tip. The luer lock tip cap should then be replaced and the syringe is now ready for the centrifuge.

With unfilled epoxies, the centrifuge should be run from 1,000 to 3,000 RPM for 3 minutes. This will remove all minute bubbles suspended within the epoxy. If any large bubbles appear near the piston of the syringe, be sure to keep the syringe tip down during storage so that they are not able to move into the epoxy. These large bubbles are micronized air that was pulled from the epoxy during the centrifuge process.

Filled epoxies can also be degassed this way as well but special care needs to be taken to ensure that the filler does not separate out of the epoxy. Generally, the speed should be kept at a maximum of 1,000 RPM for 3 minutes. This will remove the bubbles but not drag the filler out of the resin.

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Heat:

Heat is a simple and efficient way to remove bubbles from epoxy. The key to this technique is to keep the product in a wide container that has large amounts of epoxy in the X and Y dimension, but little in the Z dimension. This gives the maximum amount of surface area for the bubbles to escape. **This method should only be used for epoxy in an open container.**

The wide container should be placed into an oven that has been pre-heated to 35°C - 40°C for approximately ten minutes. If there are still large amounts of bubbles in the epoxy, the product can be kept in the oven a bit longer. Be sure to keep track of the pot life of the product and remember that heat can act as a catalyst and speed up the cure. Sometimes it is necessary to lightly brush the top surface of the material with a spatula to break the surface tension on any bubbles that are not able to get to the surface easily.

For other useful tips, contact our Tech Service Group:
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