

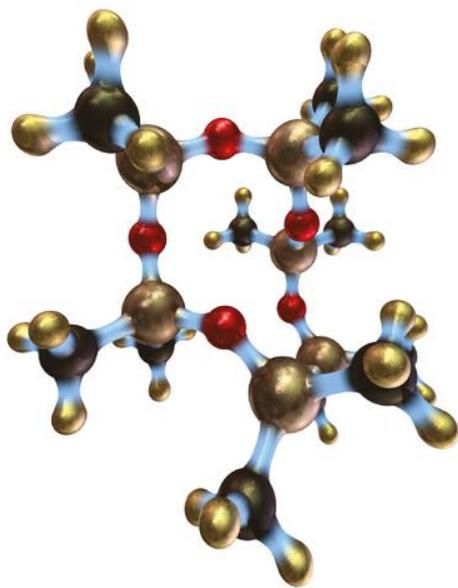
Epoxy and Silicone Interactions

WHAT

Epoxy and Silicone Interactions

WHY

Epoxy and Silicones can co-exist favorably within the same application when applied properly.



Silicone Molecule

Epoxy adhesives are a great choice for many applications for their excellent adhesion, chemical and temperature resistance, as well as many other attributes. When selecting an epoxy for a specific application, it is important to consider any potential negative interactions from alternative chemistries that may be used within the same design.

This tip will review potential epoxy and silicone interactions when used together for a specific application. When applied properly, both materials can co-exist favorably within the same application, however, they can also be problematic if used incorrectly.

Three main points to be aware of when working with epoxies and silicones:

- Proper handling of epoxy and silicone is a must
- Potential silicone contamination (invisible) of the epoxy can occur
- Possible poisoning/inhibition of the silicone cure by the epoxy can also occur

Proper Handling of Epoxy & Silicone

In order to keep your laboratories clean of cross-contamination, and to avoid manufacturing line-down situations, it is imperative to consider the following guidelines and procedures for handling and curing epoxies and silicones:

- Best practice states that epoxy and silicone handling and curing should always be performed in separate laboratories, with NO connecting air vents.
- Always clean parts to be certain that any trace mold release agents (usually silicone based) are thoroughly removed.
- Once an epoxy is fully cured, or a silicone is fully cured, they can be used adjacent to each other without any issues.
- Silicone only oven; epoxy only oven.

Silicone Contamination on Epoxy Adhesive Bonding

Examples of where silicones are often used or found:

- Adhesives, encapsulants, glob tops and potting agents
- Optical gels and greases
- Thermal interface pads and greases
- Trace contaminant from molded and de-molded parts as silicone-based mold release agents.
- Silicone oils released from jacketing of coaxial and fiber cable

Potential Contamination Outcome

Generally, wet state and fully cured silicones will not poison the epoxy curing process itself. But the silicone, as well as its by-products, can be catastrophic for the strength and wetting of the epoxy interfaces (substrate to substrate adhesion) down-stream by forming an ultra-thin coating on these surfaces. The presence of silicone, and its inherent nature to be a “release” type of product, can cause total epoxy **adhesive** bonding failure. In other words, the mode of failure changes from what might be an expected failure outcome (cohesive failure) to an undesired adhesive failure (adhesive failure) as shown in figures 1 and 2.

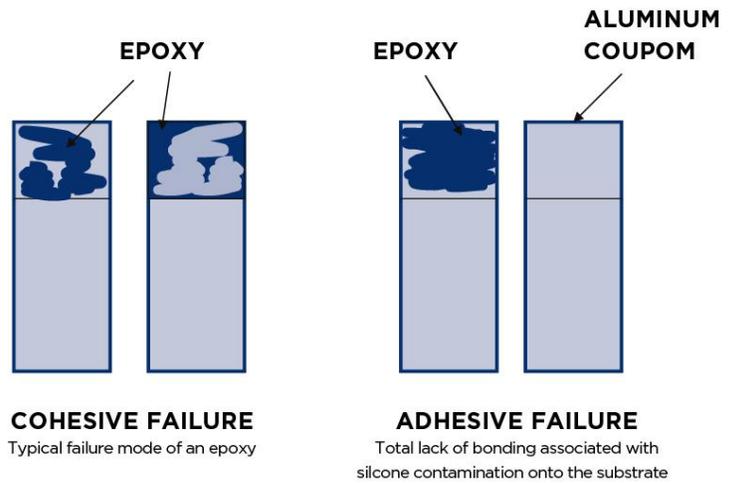


Figure 1

Figure 2

NOTE

When using epoxies and silicones within the same application, it is critical to properly clean and be aware of any potential cross-contaminants before the epoxy bonding. Also, certain protective gear (ie. gloves, lab coats, etc.) should not be overlooked as they can be a source of silicone contamination.

Possible Poisoning/Inhibition of the Cure by an Epoxy in Addition Cure Silicones

Based on the type of curing agent in the epoxy adhesive, proper silicone curing can be affected. Amine-based curing agents are frequently used in epoxy hardener systems. These curing agents can differ in composition, aliphatic or aromatic; as well as functionality via mono, di- or tri-amine.

Platinum catalysts, used in most addition cure silicones, are very susceptible to poisoning from amine-based epoxy curing agents. Wet silicone can easily be spoiled by adjacent wet or amine cured epoxy, as even cured epoxy outgassed vapors can inhibit the silicone cure. Poisoning can range from a slight tackiness on the surface to a complete failure of the cure. Silicones users should be aware of this in order to assess any potential risk. Consult our MSDS or contact our Application Experts to determine your epoxy hardener composition.



CONCLUSION

Proper handling and knowledge of epoxies and silicones adhesives, including their potential interaction, allows for both materials to be used successfully within the same application.