

What >
Mold Release Agents

Why >
Mold release agents work well when used properly with epoxy adhesives.



Using Mold Release Agents with Epoxy Adhesives

Epoxy adhesives are universally known for their high strength and toughness in bonding a wide variety of substrates found in semiconductor and electronics assembly. Although an epoxy's inherent nature is to provide a strong bond, there may be some areas where adhesion is unwanted or unintended. These occasions are where a mold release agent can play an important role.

Where Can Mold Release Agents Be Used?

Mold release agents are used for:

- Preventing adhesion to unintended surfaces in potting and casting electronics
- Coating a mold to be used for molding epoxy into various shapes and formats
- Protecting fixtures or tooling so the epoxy can be easily removed when finished

Potting and Casting Electronics

Potting usually refers to a liquid epoxy resin encapsulant which covers and protects the electronics beneath it. Potting resins are commonly self-leveling and will take the shape of their host container. These materials are used in electronics applications for:

- Protection from harsh environments such as chemicals and moisture
- Color coding and cosmetic appearance
- Security in the form of protecting electronics from being reverse-engineered
- Increasing the dielectric performance of the circuit
- Thermal management and general heat dissipation

Casting usually refers to epoxy potted electronics that are removed or recovered from a mold. They can also be described as “**casted electronics**” or “**casted electronic components**”.

Conversely, when the epoxy potted electronics remain inside a housing, chassis, package or hybrid, it is said to be “**potted electronics**” as described above. Whether potted or casted, both utilize similar concepts and processes; including the same epoxy product.

In summary, the main difference between potting and casting is potted electronics generally do **not** use mold release agents, whereas casted electronics do in order to facilitate a release from the host container.

Molding Epoxies

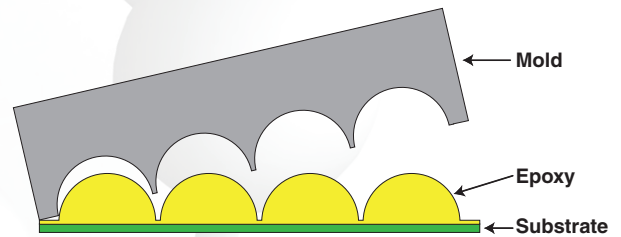
Since epoxies are capable of a low viscosity, liquid appearance, they can be molded into various shapes, much like traditional injection molding techniques of thermoplastics. Epoxy resins, however, are thermosetting polymers and should be handled differently.

Note: *The pot life of each epoxy should be carefully monitored to ensure optimum molding results.*

Applications of Molded Epoxies

Epoxy resins can be molded into shapes for various applications including:

- Lens optics, electro-optical packaging of fiber optics and sensor devices. Ingots of molded epoxy can be diced, machined, lapped and polished into lens shapes including hemispherical, spherical, cylindrical and concave/convex geometries.
- Micro-molded camera lens optics directly molded onto CCD/CMOS or glass wafers, using the de-wetting properties contributed from silicone molds.
- Medical implants such as molding around titanium venal access ports or molding a feed-through wire into a pacemaker hermetic case.
- Test specimens for scientific measurements, including: optical, physical, mechanical, electrical and thermal analysis of epoxy resin or epoxy impregnated composites.



Molded Lens Optics

Fixturing and Tooling

Fixtures are used for the purpose of holding parts in high volume arrays for critical alignments, and providing bonding forces and assistance during cure. Similarly, tooling involves the use of tools, clamps, carriers and trays where epoxy splashes or deposits are undesirable. In order to avoid this unwanted overspill of material onto the fixture or tool, a mold release agent is applied to facilitate release.

Suggested Mold Release Agents

The following materials are commonly chosen as mold release agents:

- **Teflon® (PTFE) based products.** Epoxies are very polar molecules and will release well from non-polar surfaces. An example of a PTFE based spray coating that works well is a The Dry Release Agent from Miller Stephenson Chemicals Company.
- **Wax.** Wax is another material having a non-polar surface along with high molecular weight. When selecting a specific wax, it is important to choose one that has a high enough melting temperature, in relation to the epoxy curing temperature. Waxes are often used for temporary holding of semiconductor wafers during the dicing/sawing/lapping processes.
- **Silicones.** Silicones can work as well, however special precautions should be taken in handling in order to avoid any potential epoxy and silicone interactions. *See EPO-TEK Tech Tip 21 for more information.*
- **Sodium Dodecyl Sulfate (SDS) Soap.** Especially found in the medical industry, where many implantable devices such as hearing aids, may be molded using a biocompatible epoxy. In these applications, SDS soap is often the mold release agent of choice.

For other useful tips, contact our Tech Service Group:
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