OSTEMER® 324 Flex

Overview

Name: OSTEMER® 324 Flex

Type: Two-component thiol-ene-epoxy, also known as "OSTE+"

Primary use: Rapid molding manufacturing or prototyping of flexible micro-plastic components and assemblies.

Storage: Can be stored in room temperature. For optimal shelf life store in a refridgerator, let the components reach room temperature before use.

Handling: Always use gloves and work in a well-ventilated space. Read the MSDS.

Features

The OSTEMER® 324 is a dual cure polymer with high transparency and minimal coloration with flexible end properties. After mixing the components in the ratio stated on the B component, the resin is first UV-casted to a soft plastic article with unreacted epoxy glue. The polymer will stiffen and bond at room temperature but for best results it is accelerated by a thermal treatment. The OSTEMER® 324 can bond to most substrates that standard epoxy glue can bond to.

Potlife after mixing	> 6 hours if kept protected from UV-light
UV wavelength at first cure:	365 nm (Hg lamp or LED at 365nm wavelength), exposure time depends on thickness, typically 1 mm requires 60 sec with 12 mW/cm^2.

Recommended temperature for second cure:	110°C (higher curing temperatures may cause yellowing). At 110°C allow 60 min to ensure full second cure.
Mold shrinkage at first cure:	< 2 % (injection-reaction molding with a liquid prepolymer reservoir can reduce this to almost 0%)
Shrinkage at second cure:	Not measurable
Young's modulus:	28 MPa after full cure.
Strain until break	30%
Color/transmission:	Optically clear, light transmission between 370 nm to 1200 nm
Refractive index:	1.57-1.58
Losses 400-830 nm:	0.1-0.2 dB/cm (due to scattering), similar to COC.
Bonds to (after second cure) (ISO 2409):	Glass, metals, metal oxides, plasma/corona treated polymers, novolac photoresists etc
Acid resistance:	10% H_2SO_4 more than 1 month
Solvent resistant to:	Toluene, Water, Acetone, DMSO, Ethanol and Methanol (tested so far)

Processing guidelines

The OSTEMER® 324 consist of two components: A (hardener) and B (base). Depending on the stiffness of the final polymers different B blends can be obtained, which will have different mixing ratios. The mixing ratio is always specified on the bottle of the B component. When A and B are mixed a slow curing of the thiol-epoxy is initiated with a pot life of about 6 hours before significant viscosity increase. During this processing window the mixture can be UV-casted to form micro patterned soft stickers that can be assembled before the final hardening/bonding, which is done in oven at 110 °C for 60 min.

Mixing

Be in a well-ventilated area when handling the liquid prepolymers. The thiol component of 324 has a strong smell, which is unpleasant but not dangerous. After the complete cure the smell completely disappears.

- If component B has not been used for a long time mix it with a spatula
- Mix component A and B according to ratio stated on component B, be sure to mix well with a spatula or a stirrer. If the components are not mixed properly it may not cure or reach the intended final mechanical properties.
- Large bubbles disappear by themselves after 10-15 minutes if you let the bottle stand in a dark place. For perfect bubble free results, degas the prepolymer in a vacuum chamber.

Micro-molding and bonding

The mixed prepolymer can be UV-casted into a geometrical shape on most types of soft-lithography molds including PDMS, aluminum, PTFE or Teflon treated silicon/SU8 masters. For thick samples (> 1 mm), aluminum molds with a large thermal mass is preferential. If the polymer is very hot after the first cure the sample may bend or the epoxy-reaction starts too early. If it happens use active cooling with a Peltier element and/or reduce the exposure

dose. The OSTEMER® 324 can be UV cured to a maximum thickness that is depending on the power of your UV-lamp, but is usually in the 0.5-1 cm thickness.

For best result and reproducibility use a closed mold and injection reaction molding (see www.ostemers.com for references).

To achieve a flat surface in open molds, cover the top part of the polymer with a plastic sheet, such as Xerox transparency films or PET films, before UV-exposure. Make sure the cover is transparent at 365 nm (PET films and glass plates work, but not PMMA or polycarbonate). Carefully release the polymer from the cover after the first cure, or use the cover as a carrier for easier handling of the soft polymer film until second cure. PET films and transparency films can be peel it off after complete cure (not glass plates!).

Once UV-cured and released from the master your polymer articles can be aligned and bonded to another OSTEMER® article or to many other materials thanks to the epoxy groups. You might want to accelerate this process by lightly clamping (not always necessary) the pieces and putting them in oven/hotplate for 1 h at 110 °C. Be sure to clean the substrates you attempt to bond to with alcohol, as fat and any dirt will cause a poor bond. Do not wait more than a couple of hours between UV-exposure and bonding. If you wait too long the bond will be worse as many of the epoxy groups will have already reacted.

Let the assembly cool down to room temperature before testing the bond strength or evaluate the stiffness. At temperatures > 80 °C the polymer will always be soft.

Temperature	**Approximate curing time for the second cure**
Room temperature	36-48 h
40 °C	24 h
75 °C	6 h
110 °C	1 h

Exposure

NOTE: Curing times can be VERY different depending on the UV-lamp you use. Generally Hg mask aligner lamps require 40 – 100 seconds. If you have a plastic cover on your mold the curing time can be longer.

You might have to try different exposure times, as a comparison a 12 mW/cm^2 Hg-lamp, need roughly 60 seconds. LED-lamps with 365 nm wave length will also work.

NOTE ON USE: The OSTEMER® 324 is for research and development use only. It may not be used in implants or in direct or indirect with human tissue. Always wear protective gloves and splash goggles, work in a ventilated environment and avoid contact to skin and eyes. If exposed on skin, clean with large amount of water and soap. If exposed in the eyes clean with water for at least 15 min. If swallowed get medical assistance.

For incorporation in commercial products contact Mercene Labs AB to register a commercial license for your specific product. The use of OSTEMER polymers or similar thiol-ene or thiol-ene-epoxy formulations for micro patterning and bonding is patented.

For more information and continuously updated instructions of use and MSDS, please check www.ostemers.com. If you have questions or feedback about the processing do not hesitate to mail support@mercenelabs.com we are always eager to help!

Troubleshooting

1. **Component A smells bad when opening the bottle**
   Trace amounts (ppb) of contaminants from the thiol monomers cause the smell. It is not dangerous but unpleasant. Solution: Work in a fume hood to avoid annoying your neighbor. After curing the polymer is completely odorless.

2. **The resin is still liquid after UV-exposure**
   Check that the two components are properly mixed. Make sure your UV-lamp has enough intensity and correct wavelength (365 nm). Normal tabletop mercury UV-glue lamps should work fine as well as mask aligners used in silicon processing. UV chambers are generally too weak. Try exposing for longer times and make sure you are not using any UV-absorbing material between the resin and the lamp (such as PMMA or PC). Clean the mold with isopropanol to remove the unpolymerized monomers.
   If you are using a top cover during the first cure, is it transparent to 365 nm?

3. **The polymer becomes stiff after second cure but do not bond**
   Make sure the substrate you want to bond to is clean and make sure that you bond within a few hours after mixing the components. Thick pieces may also generate enough heat during the UV curing that the second cure is prematurely accelerated. If it is very hot after UV cure, reduce the UV dose. Try cooling the mold, using an aluminum mold or exposing in shorter doses, use a filter (e.g. thick polycarbonate) to slow down the mechanism.

4. **The polymer article is bent and discolored after the UV-cure**
   If the polymer is very thick the heat generated during the first UV cure will cause the polymer article to warp. Reduce exposure and/or use an aluminum mold. See www.ostemers.com for references.

5. **Component B is solid after taking it out from the refrigerator**
   Slowly heat the bottle in water bath or in oven (max 60 deg) until liquid. Mix.

The OSTEMER® resins are a product of

Mercene Labs

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