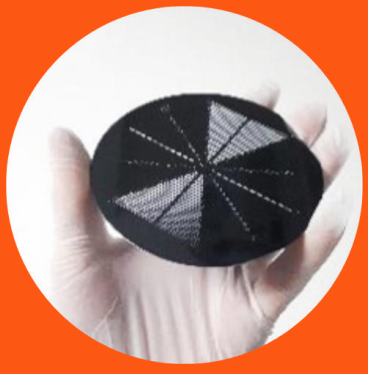

Eden Materials

Epoxym™ Kit User Guide

Production of Replica Epoxy Molds for Embossing

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Contents

1. Description

Epoxym™ is a multi-functional and easy-to-use solution to replicate molds into epoxy resin mold.

The two-step system allows first the fabrication of a counter mold in silicone (e.g., polydimethylsiloxane), which is then used to replicate the master mold in epoxy.

2. Safety Notes

The aim of this quick start guide is to illustrate how to use the Epoxym™ equipment for Epoxy mold replica fabrication. Please, always consult the safety notes or procedures that may be related to your specific equipment prior to use.

As with all laboratory activities, gloves and lab coats should be worn at all times during the process. It is the user's responsibility to consult the manufacturer's recommendation for the chemicals used and - if required - to ensure adequate ventilation/extraction (e.g., via a fume hood) prior to proceeding.

Do not exceed the maximum temperature stated in the equipment specification.

3. Equipment Required

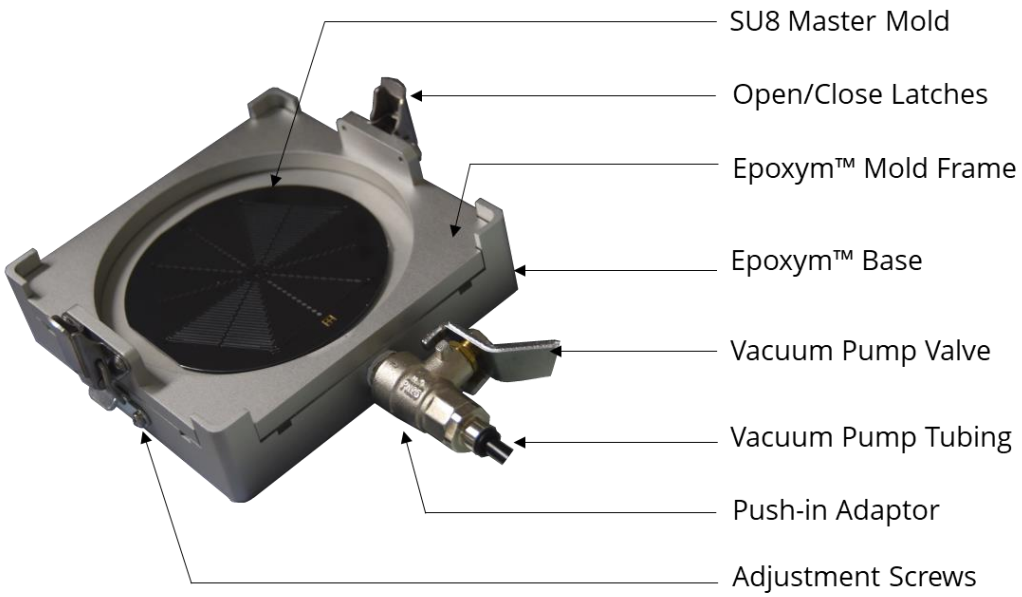
Materials provided in this kit:

Material	Quantity
Epoxym™ Base with Valve	1
Epoxym™ Mold Frame for PDMS	1
Epoxym™ Mold Frame for Epoxy	1
O-ring, FKM, 126 x 3 mm	1
Flexdym™ Seal Sheet	1
Epoxy (Resin & Hardener)	1
Silicone Spray	1

Additional material or equipment required:

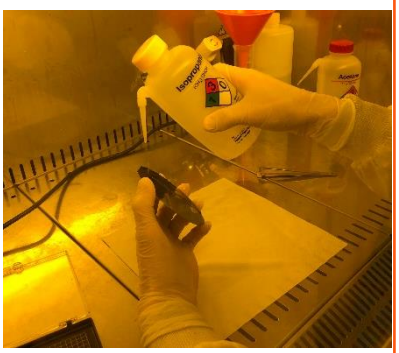
- PDMS (Base & Curing Agent)
- Master Mold
- Oven
- Hot plate
- Desiccator
- Vacuum pump with 6 mm OD Tubing
- Ethanol or isopropanol
- Adhesive tape
- Tweezers
- Scalpel

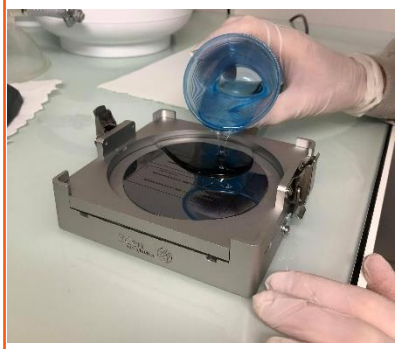
4. Epoxym™ Components

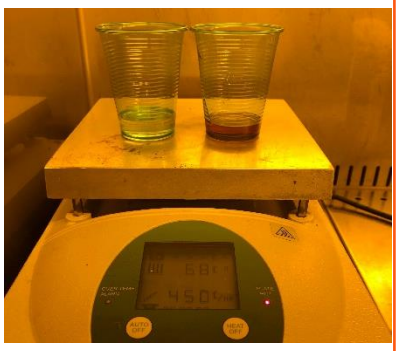
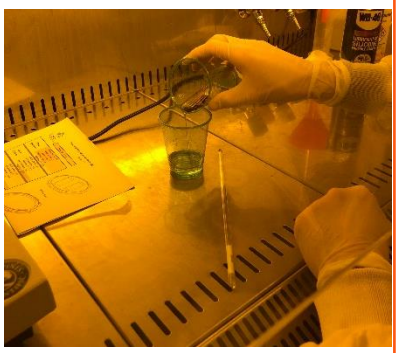


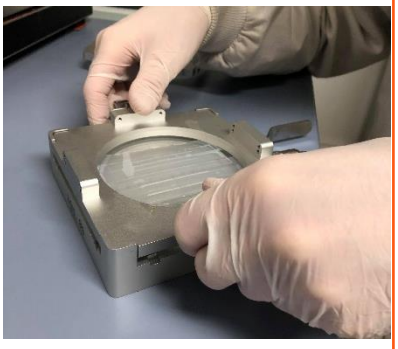
5. Operating Instructions

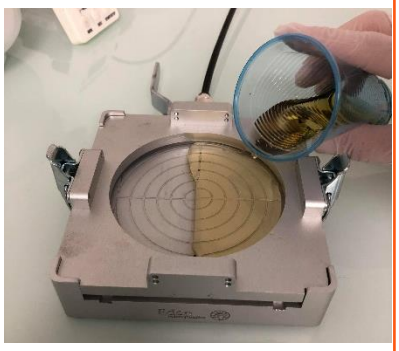
The Epoxym™ kit can be used to produce replica epoxy molds resistant to high temperatures, up to 180ºC. The SU-8 on silicon master mold is first converted into an intermediary PDMS mold, which is used to produce the epoxy mold.

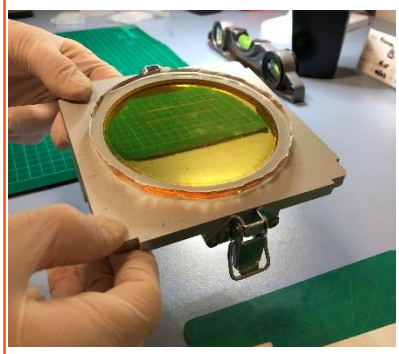
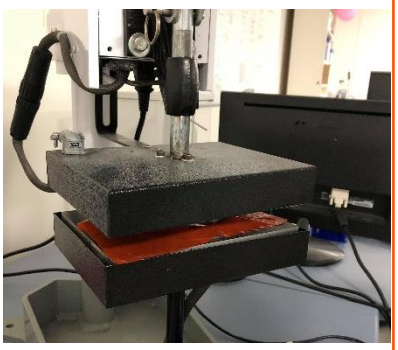
Step	Description	
1	**Preparation of PDMS Mold** Prepare the PDMS solution by mixing the base & hardener according to the manufacturer's instructions (e.g. ratio of 1:10 for Sylgard™ 184). Evaluate the PDMS volume to get 3-7 mm thick PDMS counter-mold. **Tip:** For Sylgard™ 184 respective quantities of 60 g and 6 g should suffice.	
2	Desiccate the PDMS mix for at least 30 minutes to remove all air bubbles.	
3	In the meantime, gently clean the silicon master mold to be replicated with isopropanol/ ethanol and preferably use an air gun to dry it.	

Step	Description	
4	**Preparation of the Mold Frame** Place the Flexdym™ sealing sheet on the top of the the base. Place the black rubber o-ring seal in the PDMS mold frame top. Then place the master mold in the center of the base. Close the mold frame using the side latches. Connect the entire system to a vacuum pump. Turn on pump and open the Epoxym™ valve.	
5	Very gently, pour the degassed PDMS into the mold frame. **Note:** This process should be done slowly to not produce air bubbles at the level of the microstructures.	
6	**PDMS Mold Bake** Close the vacuum valve and disconnect the Epoxym™ from the pump. Bake the PDMS for 1-2 hours at 80-90ºC (according to the manufacturer's instructions) in the oven. **Note:** Make sure the oven shelf is flat.	

Step	Description	
7	**Preparation of Epoxy** Weigh the epoxy component A (resin) and B (hardener) according to the calculation table (section 7). Then heat up the components separately on a hot plate set at 70ºC for at least 10 minutes. **Note:** We recommend performing epoxy handling and heating in a well-ventilated area or in a fume hood. Be sure to clean the edge of the bottles well so the dry epoxy does not glue the bottle shut. Seal bottle cap with parafilm.	
8	Mix components A and B of the epoxy using a stirrer. Heat at 70ºC for another 10 minutes. **Tip:** By pouring component B (hardener) into component A (resin), volume waste is minimized.	
9	Desiccate epoxy mix for at least 1 hour to get rid of air bubbles.	

Step	Description	
10	Remove the Epoxym™ from the oven. Unmold PDMS from frame. **Tip:** Protect the PDMS molded microstructures from dust, by covering with adhesive tape. Open the vacuum valve. Gently remove the Flexdym™ seal sheet and master mold from the base with the help of flat tweezers. **Note:** Store Flexdym™ seal sheet with anti-adhesive liner for protection.	
11	Coat the epoxy mold frame top with a silicone spray to ease the epoxy unmolding step. **Note:** This part is required to be coated.	
12	**Cast Epoxy on PDMS Mold** Place PDMS mold face up in the center of the base and use the epoxy mold frame to close the system via the side latches. Connect to vacuum pump. Open valve and apply vacuum. Remove the tape from the PDMS mold. **Note:** The PDMS mold must be flat. If it presents a curvature, it is possible a “meniscus” has been created at the edges. This can be cut off using a scalpel.	

Step	Description	
12	**Note:** The side latches can be unscrewed and moved to another threaded slot. This allows to adjust the tightness and seal of the frame depending on the PDMS counter-mold thickness.	
13	Pour the epoxy mix into the mold frame very gently, in order to not create bubbles. Close vacuum valve and disconnect from pump. **Note:** Remove the push-in adaptor connecting the Epoxym™ base to the vacuum pump tubing. It contains plastics which will melt in the oven.	
14	**Epoxy Mold First Bake** Place epoxy in the oven at 120ºC and bake for 20 hours. **Note**: Make sure the oven shelf is flat.	

Step	Description	
15	Open the side latches and unmold the epoxy mold from the mold frame. Cover the PDMS counter-mold with a scotch tape for later use.	
16	**Epoxy Mold Second Bake** Bake the epoxy mold at 180°C for 2 hours. To ensure the mold stays flat, we suggest using a heating press for baking or to use a hotplate with a weight on top of the mold.	

6. Epoxy Calculation Reference Table

The recommended epoxy mold thickness is 3 to 6 mm.

The table below indicates the quantities to be used for each epoxy resin component:

	Component A: Resin	Component B: Hardener
Parts By Volume	100	83
Parts By Weight	100	67

7. Machine Maintenance

After each use, we recommend cleaning the aluminum and PTFE frames with acetone and ethanol, and the O-ring with ethanol only. Make sure the Epoxym™ mold frame for epoxy is coated with silicone to optimize the shelf life of the tool.

Avoid contact between metallic tools and the frames, as it might damage the surface finish of the frames.

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