HEIDELBERG INSTRUMENTS

SU8 Adhesion Enhancement

SU-8 3000 is a high contrast, epoxy based photoresist designed for micromachining and other micro-electronic applications. It is also very popular for microfluidic applications where the SU-8 layer is used as a master mold for a subsequent softlithography step.

The SU8 photoresist shows poor adhesion characteristics on glass substrates. Small structures clear off during the development whereas large coherent covered areas adhere.

Fig. 1: Without adhesion promoter

Adhesion agents are used during development to improve the adherence of differing structures. These adhesion promoters are special chemicals that can be comprised within thin coatings.

The creation of chemical connections between the specimen surface and the resist as well as increasing the wettability of the substrate surface is primarily important.

To achieve best possible adhesion, the adhesion agent is ideally placed directly on the boundary and often applied as an additional layer. However, the adhesion agent can be incorporated in the photo resist.

TI Prime, OmniCoat and a thin layer of SU8-2 were tested in the course of thiw work to find the best adhesion promoter. The images illustrate the adhesion quality of the named adhesion agents on glass substrates for SU8. It turned out that a thin layer of SU8-2 gives the best adhesion for a 100 µm thick structural SU8-50 layer on glass.

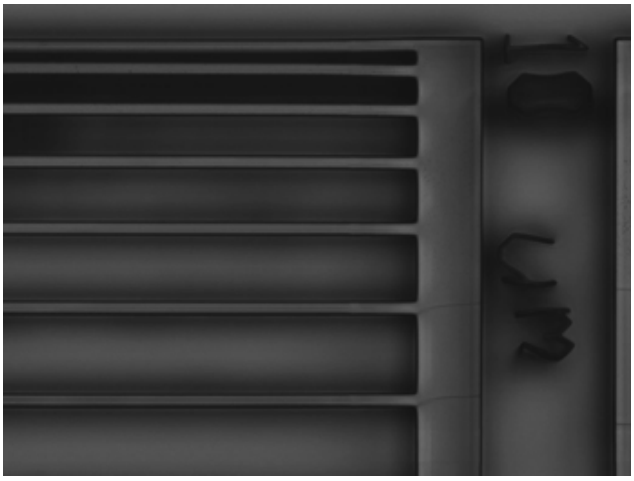

Fig. 2. With SU8-2 adhesion promoter

Process Description:

In the beginning of the process the wafer is cleaned and dehydrated. The low viscosity resist SU8-2 is applied on the substrate with a thickness of 2 µm through spin coating (40s/2000rpm).

Application Note

Following the coating procedure the liquid adhesive layer is stabilized for 1 min at 65° C and then 95°C (Soft-Bake). The manufacturer recommends baking the SU8 layers through a three-stage temperature process.

The coated wafer is completely exposed from above without mask (flood exposure). This prevents the adhesion promoting layer from being developed alongside the development of the structural layer.

For the networking of the exposed SU8-2 the wafer is placed on the hotplate for 1 min at 65°C and afterwards baked again at 95°C (Post Exposure Bake).
The heating element is turned off causing the hot plate to slowly cool down. This allows tensions to be reduced that may cause cracks later. The structural layer of 100 µm (high-viscosity resist SU8-50) is applied to the substrate after coating of the adhesive layer.

The exposure was performed on a **µPG 501 Maskless Laser Lithography System***.

µPG 501

Tabletop Maskless Aligner System

Key Features and Options

- High speed exposure engine
- Substrates up to 6“ x 6“
- Structures down to 1 µm
- Address grid down to 50 nm
- Basic gray scale exposure mode
- Real time auto focus system
- High power UV LED
- Camera system for metrology and alignment
- Multiple data input formats

SPECIFICATIONS

WRITE MODE	I	II
Address Grid [nm] Minimum	50	100
Structure Size [µm] Write	1	2
Speed [mm² / minute] Edge	50	100
Roughness [3σ,nm] CD	100	150
Uniformity [3σ,nm] Aligment	200	300
Accuracy [3σ,nm]	200	400

* The µPG501 Maskless Lithography System is replaced by the MLA100 Maskless Aligner

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