

SU-8 Photoresist Process

SU-8 2000 series is used for microfabrication of MEMS devices and other micro applications. These resists are negative resists (the exposed region with radiation is polymerized and does not develop in developer solutions; the unexposed region dissolves in developer). This particular series resists are also widely used for their thick, thermally stable imaging capabilities and have a faster drying and increased polarity solvent system than the past SU-8 series. It is mostly used for UV radiation exposure (i-line 365nm is the usual line used) in the wavelength region 340-400nm, however it can be used with direct ebeam or X-ray exposure. Before beginning the use of any of the SU-8 2000 series resists, it is imperative that you know the spin diagrams of the resist thickness you seek to deposit onto your wafer. Users will have their own acceleration, spin speed a spin time for their particular resist thickness; your entire process should be optimized for your particular device.

Note: All cleaning processes are done in the small or large yellow room fume hoods. The spinning process should **ONLY** be done in the large yellow room spinner labeled "SU-8 ONLY".

Cleaning

- 1) Your tweezers should be cleaned before handling your Si wafers. Pre-set your hotplate for a pre-bake temperature (this will allow your hotplate to reach a constant temperature while you continue with your sample cleaning). The Si sample or substrate should be cleaned properly (organics): overnight immersion in Nanostrip, at least 45 minutes in a hot piranha solution, an RCA treatment or oxygen plasma ashing can be done to clean the surface of your substrate.
- 2) Thoroughly rinse or sonicate your substrate in both acetone and then isopropanol alcohol (IPA) solvents then dry with nitrogen gun.

Process

When your SU-8 bottle is empty, discard any residual resist into the 5 gallon resist waste container under the spinners in the large yellow room. Rinse the bottle three times with DI water. Place the rinsed bottle near the 5 gallon solvent waste container located next to the eye wash. A cleanroom staff member will pick it up for proper disposal.

- 1) Use a pipet or filtered syringe to deposit the resist onto the wafer. (Note: if you require complete removal of the SU-8 film, apply OmniCoat from MicroChem to facilitate removal during lift-off).
- 2) Start the spin process. For SU-8 resists, typical spin parameters may be using a two-step spin process: a 5 second spread cycle in which the spinner ramps to 500rpm at 100rpm/second acceleration followed then by the last spin at an acceleration of 300rpm/second for 30 seconds at a spin velocity known best suited for your own resist thickness and device.
- 3) After spin deposition of the resist, the film should then be baked for densification of the polymer and solvent evaporation. Your bake time should be optimized for your device. But the following may be a starting point: pre-bake at 65 degrees centigrade for 1 min followed by a softbake at 95

degrees centigrade for 2 minutes; both for a 2um film for the SU-8 2002 resist. Other SU-8 types will have differing recommended bake times. Consult the MicroChem SU-8 resist series data sheet for such data (these data sheets are located at the vendor's website or at the Columbia University CEPSR cleanroom site: www.clean.cise.columbia.edu).

4) It is recommended to perform a visual and or optical analysis of the wafer. Dark field analysis should show if there are any particulates or other dust particles on the surface, the color of the resist should be consistent throughout the surface of the wafer expect possibly the edges due to edge bead effects.

Post Exposure

1) Following the recommended radiation exposure, a post exposure bake must be done for crosslinking selectivity of the exposed regions. A typical PEB for SU-8 2035 of 35um is 1 minute at 65 degrees centigrade followed by another bake at 95 degrees centigrade. PEB are typically two stages of different bake times at different temperatures.

2) In order to dissolve regions unexposed on your device, fully immerse your wafer or substrate sample into a solution of SU-8 Developer (agitation is recommended for high aspect ratio devices). After, dip your sample into a fresh solution of SU-8 developer solution to reduce the possibility of scumming (seen visually as a white film). To stop the developing process, dip your wafer into IPA solution. Lastly, fully dry your device with nitrogen gun blasts. (the dip times of the initial SU-8 and second SU-8 rinse are different for your particular device, for instance: SU-8 2050 at 165 um thickness will require an initial immersion into the developer for 12 minutes followed by a second rinse in developer and IPA wash.

3) Removal of SU-8 is difficult but if treated with OmniCoat, removal can be done with PG removal for a cleaner lift-off process.