

Standardization on EVG620 and Suss-MicroTec MJB4 Mask Aligners

1. A List of the Positive Resists,

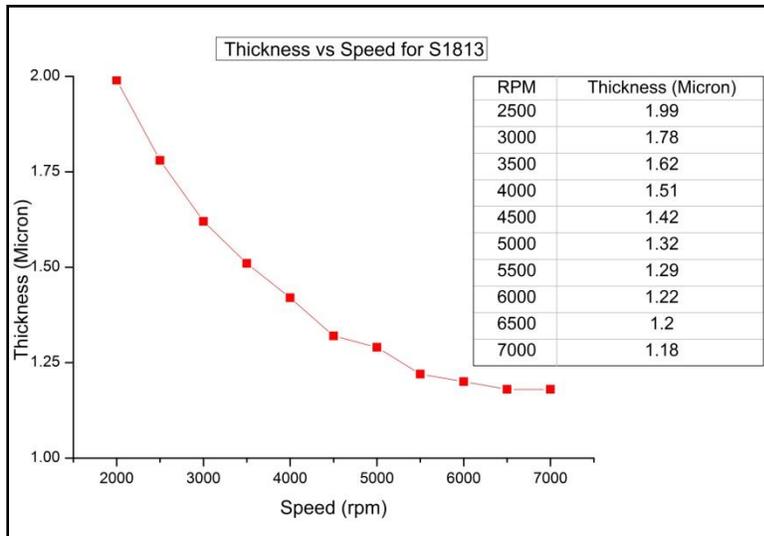
1.1. S1813,

Introduction,

This positive photoresist allows thickness from 1.2 μ m to 2.0 μ m. This standard positive photoresist can be used in a wide variety of process flow from wet etch, dry etch to lift-off process.

Spin-coating parameters using a Laurell Manual Spin-coater,

A general three-step program is used for spin coating the resists, a small ramp of 500rpm for 5secs is given and next spun at 4000rpm for 40 secs and a small ramp down of 5 secs is given. The graph depicts the variation in thickness depending on the rpm, which was measured on a Surface Profiler.



Depending on the parameters such as Spin speed, Soft bake, Minimum feature size on the mask etc. the dosage and development time have to be optimized.

Standard Thickness	Speed	Soft bake at 110C	UV Exposure in EVG620	UV Exposure in MJB4	Development in AZ351B(1:4)	Hard Bake at 110C
1.5 μ m	4000 rpm for 40 secs	60 seconds	50mJ/cm ²	8 seconds	20-25 seconds	180 seconds

Note: Baking time mentioned in the above table is carried out on a hotplate and it varies when done in an oven.

References: <http://nanofab.ece.cmu.edu/resources/s1800seriesDataSheet.pdf>

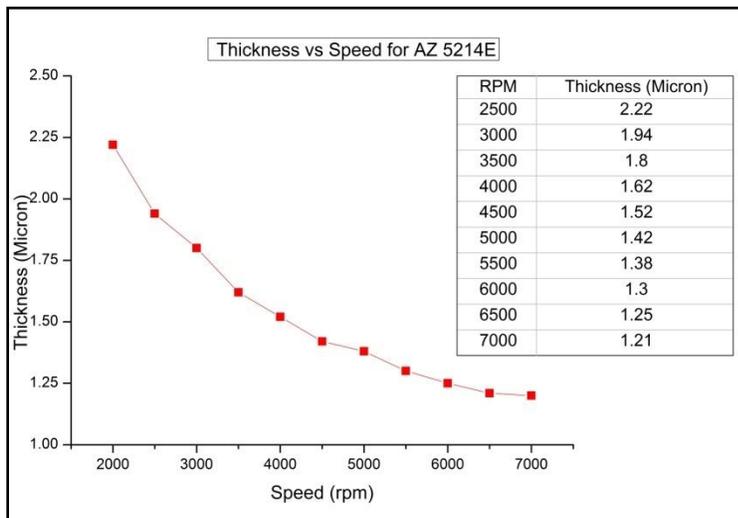
1.2. AZ5214E,Image-Reversal Resist

Introduction,

This positive photoresist allows thickness from 1.4 μm to 2.0 μm . This standard positive photoresist can be used in a wide variety of process flow from wet etch, dry etch, Image reversal to lift-off process.

Spin-coating parameters using a Laurell Manual Spin-coater,

A general three-step program is used for spin coating the resists, a small ramp of 500rpm for 5secs is given and next spun at 4000rpm for 40 secs and a small ramp down of 5 secs is given. The graph depicts the variation in thickness depending on the rpm, which was measured on a Surface Profiler.



Depending on the parameters such as Spin speed, Soft bake, Minimum feature size on the mask etc.. the dosage and development time have to be optimized.

Standard Thickness	Speed	Soft bake at 110C	UV Exposure in EVG620	UV Exposure in MJB4	Post Exposure Bake at 110C	Development in AZ351B(1:4)	Hard Bake at 110C
1.6 μm	4000 rpm for 40 secs	60 seconds	50mJ/cm ²	8 seconds	60 seconds	20 seconds	180 seconds

Note: i) Baking time mentioned in the above table is carried out on a hotplate and it varies when done in an oven.

ii) An additional PEB step is done for Image Reversal Process.

iii) No hard-bake is done for Lift-off process.

References: http://www.microchemicals.com/micro/az_5214e.pdf

http://nanofab.ece.cmu.edu/resources/AZ_5200.pdf

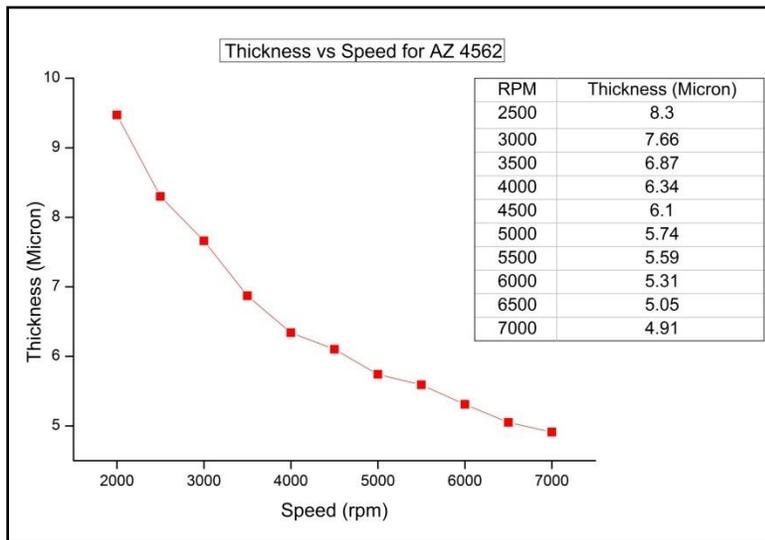
1.3. AZ4562, DRIE Resist

Introduction,

This positive photoresist allows thickness from 6.2 μm to 9.7 μm . This standard positive photoresist can be used for deep etches and commonly known as Deep reactive Ion etch resist.

Spin-coating parameters using a Laurell Manual Spin-coater,

A general three-step program is used for spin coating the resists, a small ramp of 500rpm for 5secs is given and next spun at 4000rpm for 40 secs and a small ramp down of 5 secs is given. The graph depicts the variation in thickness depending on the rpm, which was measured on a Surface Profiler.



Depending on the parameters such as Spin speed, Soft bake, Minimum feature size on the mask etc.. the dosage and development time have to be optimized.

Standard Thickness	Speed	Soft bake at 110C	UV Exposure in EVG620	UV Exposure in MJB4	Development in AZ351B(1:3)	Hard Bake at 110C
6.2 μm	4000 rpm for 40 secs	60 seconds	110mJ/cm ²	12 seconds	60 seconds	180 seconds

Note: Baking time mentioned in the above table is carried out on a hotplate and it varies when done in an oven.

References:

http://www.first.ethz.ch/infrastructure/Chemicals/Photolithography/Data_AZ4500.pdf

1.4. LOR 10A,

Introduction,

This positive photoresist gives an approximate thickness of 1µm when spun at standard speed of 4000rpm for 40 seconds. This standard positive photoresist can be used for Bi-Layer Lift-off processes and an under-cut can be achieved. This positive resist is followed up with S1813 Photoresist to carry out the standard Bi-Layer Lift-off process.

Spin-coating parameters using a Laurell Manual Spin-coater,

A general three-step program is used for spin coating the resists, a small ramp of 500rpm for 5secs is given and next spun at 4000rpm for 40 secs and a small ramp down of 5 secs is given. A curing time of 15 minutes is given which is followed by spinning the second layer resist S1813 at standard parameters mentioned in **section 1.1**.

Depending on the parameters such as Spin speed, Soft bake, Minimum feature size on the mask etc.. the dosage and development time have to be optimized.

Standard Thickness	Speed	Soft bake at 110C	Curing Time	S1813 Resist spin coated at standard parameters as mentioned in section 1.1	UV Exposure in EVG620	UV Exposure in MJB4	Develop S1813 in AZ351B(1:4)	Develop LOR10A in MF-26A
1µm	4000 rpm for 40 secs	60 seconds	900 seconds		45mJ/cm ²	7 seconds	20-25 seconds	75 seconds

Note: i) Baking time mentioned in the above table is carried out on a hotplate and it varies when done in an oven.

ii) No hard-bake is done for Lift-off process.

References: <http://microchem.com/pdf/PMGI-Resists-data-sheetV-rhcredit-102206.pdf>

2. A List of Negative Resists,

2.1. SU-8 Series

The below table shows a list of negative SU8 series resists available.

Resist	Series
SU8	2002
	2005
	2015
	2035
	2100
	2150

For further details on the process refer,

http://www.microchem.com/pdf/SU-82000DataSheet2000_5thru2015Ver4.pdf

<http://www.microchem.com/pdf/SU-82000DataSheet2025thru2075Ver4.pdf>

<http://www.microchem.com/pdf/SU-82000DataSheet2100and2150Ver5.pdf>

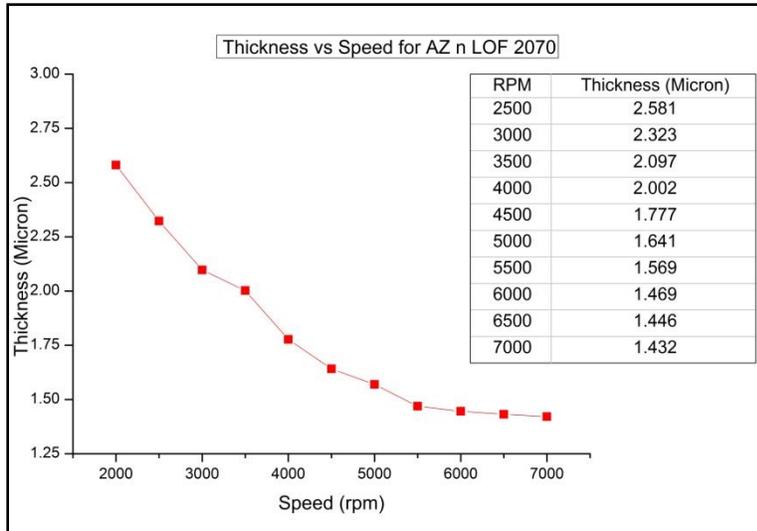
2.2. AZnLOF 2070 2 μ m, Negative Lift-off resist

Introduction,

This negative photoresist allows thickness from 1.2 μ m to 2.0 μ m. This standard negative photoresist can be used in a wide variety of process flow from wet etch, dry etch and most specifically for lift-off process.

Spin-coating parameters using a Laurell Manual Spin-coater,

A general three-step program is used for spin coating the resists, a small ramp of 500rpm for 5secs is given and next spun at 3000rpm for 40 secs and a small ramp down of 5 secs is given. The graph depicts the variation in thickness depending on the rpm, which was measured on a Surface Profiler.



Depending on the parameters such as Spin speed, Soft bake, Minimum feature size on the mask etc. the dosage and development time have to be optimized.

Standard Thickness	Speed	Soft bake at 110C	UV Exposure in EVG620	UV Exposure in MJB4	Development in MIF 726	Post exposure bake at 110C	Hard Bake at 110C
2 μm	3000 rpm for 40 secs	60 seconds	65mJ/cm ²	8 seconds	30 seconds	60 seconds	180 seconds

Note: i) Baking time mentioned in the above table is carried out on a hotplate and it varies when done in an oven.

ii) No hard-bake is done for Lift-off process.

iii) An additional PEB step is done for Cross-linking the polymers.

References:

http://www.first.ethz.ch/infrastructure/Chemicals/Photolithography/Data_AZnLof2070.pdf