Negative Resist NR7-1500PY photolithography

Process name: Negative PR

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Overview

Negative Resist NR7-1500PY is a negative tone photoresist designed for 365nm wavelength exposure. It tends to exhibit better adhesion to various substrates such as Si wafer, glass, and metals. It also exhibits higher temperature resistance over positive resists. Exposure to the UV light causes the negative resist to become polymerized and more difficult to dissolve. Therefore, the negative resist remains on the surface wherever it is exposed, and the developer solution removes only the unexposed portions. Negative photoresist is very useful in the micro fabrication process. This is level 2 process.

Time needed

The spin steps take approximately 5 minutes. The lithography (exposure and develop) takes approximately 10 minutes. The entire process needs approximately 30 minutes.

Materials needed

- Glass wafer or other clean substrate.
- HMDS to enhance adhesion of photoresist
- Negative photoresist NR7-1500PY or NR7 1000PY
- Developer MF319 or Resist Developer RD6
- Acetone and Isopropanol: releasing photoresist
- Mask.
- Glass container.

Preparation

Clean substrate of samples with Acetone, Ispopropanol, following DI water rinse and blow dry. Dehydrate substrate in 120 C oven for 20 minutes.

Procedure

1. Spin HMDS coatings on substrate by a one-step spin process at 3000 rpm for 30 seconds with an acceleration of 425rpm/s in order to enhance the adhesion of photoresist. Bake HMDS coatings at 90°C on hotplate for 3 minutes.

2 Spin NR7-1500PY or 1000PY on substrate. The table of Spin speed vs. thickness:

	Spin 40 s at	Soft bake at 150C hotplate	Exposure	Post bake at 100C hotplate	Develop with MF319	Thickness
NR7- 1500PY	800 rpm	60s	2 mins (MA6)	2 mins	10 s	1.5um
NR7- 1000PY	3000rpm	60s	1.5mins(MJB3)	2 mins	10s	3um

3. Inspect the patterned to ensure that there is no residue and that all features are patterned properly.

4. Hard-bake at 90^oC oven for 20 minutes is optional.

Clean up

- Rinse and wipe the spinning machine well with acetone.
- Dispose acetone in the blue bin.
- MF-319 developer is disposed in the waste container labeled MF-319.

Safety and Emergency

All INRF safety and procedural regulations must be followed. Review the INRF standard operating procedures for fire, chemical spill, and chemical exposure. Photoresist and acetone are flammable chemicals. Do not store the photoresist or acetone near the hotplate or any other source of heat. Any small spills should be wiped up immediately with wipes. Dispose the wipes in the flammable waste container.

In case of exposure to skin or eyes, flush immediately with water for 15 minutes. Remove all clothing that are exposed and flush with water. Report to INRF staff or report to EH&S. Seek medical attention to ensure that the burns are minimal. In case of large spill, follow the INRF Standard Operating Procedure for chemical spills.

References

Futurrex, Inc. product literature

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NEGATIVE RESIST NR7-1500PY

Description

- Negative Resist NR7-1500PY is a negative tone photoresist designed for 385nm wavelength exposure, using tools such as wafer steppers, scanning projection aligners, proximity printers and contact printers.
- After resist development, NR7-1500PY exhibits a negative-sloping resist sidewall profile, which facilitates a simple resist lift-off process.
- These are the advantages of NR7-1500PY over other resists:
 - superior resolution capability
 - fast develop time
 - easy adjustment of the degree of resist undercut as a function of exposure energy
 - superior temperature resistance of up to 180°C
 - superior selectivity in RIE process
 - easy resist removal in Resist Remover RR4
 - shelf life exceeding 3 years at room temperature storage.
- The formulation and processing of NR7-1500PY were designed with regard to
 occupational and environmental safety. The principal solvent in NR7-1500PY is
 cyclohexanone and development of NR7-1500PY is accomplished in a basic water
 solution.

Properties

	Solids content (%)	24-28			
	Principal solvent	cyclohexanone			
	Appearance	light yellow liquid			
	Coating characteristic	very uniform, striation free			
	Film thickness after 150°C hotplate bake for 60 s.				
	Coating spin speed, 40 s spin (rpm);	(nm)			
	800	2850-3150			
	1000	2565-2835			
	2000	1805-1995			
	3000	1425-1575			
	4000	1235-1365			
	5000	1140-1260			
٠	Sensitivity at 365 nm exposure wavelength (mJ/cm² for 1 µm thick film)	390			
•	Guaranteed shelf life at 25°C storage (years)	3			

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