photoresist mr-DWL 40

Standard operating procedure

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Location: Building C, room C1.31

Cleanroom class: 100 (1000 in corridor)

Responsible operators: Radim Hrdy, radim.hrdy@ceitec.vutbr.cz

Erik Pálesch, erik.palesch@ceitec.vutbr.cz

Jakub Sadílek, Jakub.sadílek@ceitec.vutbr.cz

Training requirements: Safety training 100

FUMEHOOD SC1 certificate

RCD certificate

DIENER certificate

Optional SUSS MA8 or DWL

Requirements for work: Wafer PEEK tweezers or any other PEEK tweezers

Vacuum tweezers

Completely new or pre-cleaned wafers

Contents

Introduction to mr-DWL resist

mr-DWL is a chemically amplified negative tone photoresist series for micro systems technology

- specifically designed for optical applications in micro systems technology such as microfluicds
- UV broadband sensitive, designed for exposure with a wavelength above 400 nm
- for fast and contactless prototyping by direct laser writing @ 405 nm
- well suitable for the application as an etch mask exhibiting high dry and wet etch resistance
- high transparency to visible light -excellent thermal stability of the resist patterns
- development in organic solvents

Before you start working, READ the datasheet of resist producer!

AVAILABLE HERE

SOP for mr-DWL40

The SOP is optimized for syringe spin coating on RCD8.

Resist preparation

1. Resist diluting (Optional)

If you need to prepare lower concentration other than is disponible.

has NOT been tested yet. Strongly recommendation for this step to ask for help to the chemical laboratory supervisor or experienced user

2. Syringe filling

(a) Temper the bottle with resist to room temperature.
(b) Use the precleaned syringe, tip and piston, use PGMEA solvent.
(c) Close the syringe by tip
(d) Fill the syringe by wall side to prevent bubbles presence, leave the space for piston
(e) Prewet the rubber ring of piston by resist and gently press it to syringe
(f) Fix the syringe to RCD8 motor syringe holder, hold it with tip to up and open the tip.
(g) Release the remained air bubbles by manual operation mode of RDC8 – check RCD8 manual
(h) Release syringe and switch RCD8 to automatic mode
(i) Wait minimally 6 hours (12 hours is optimal) before using or storage in the fridge is not necessary.

Resist coating

1. Clean wafers

(a) Remove photoresist if wafers are being reworked using PGMEA solvent and O_2 Plasma Diener for 20 min.
(b) *Optional - RCA cleaning of wafers - for more details go to- SOP - RCA cleaning of wafers*
(c) Dehydration baking at Hot plate: 30 min @ 180 °C minimum – cool to room temperature before spincoating

2. Promotor (Optional)

Use the promotor for adhesion improvement if it is necessary AR-300.
(a) Usually, the additional promotor is not necessary.

3. Spin-coat wafers

(a) Fix the syringe to RCD8 motor syringe holder and open the tip.
(b) Release the remained air bubbles by manual operation mode of RDC8 – check RCD8 manual
(c) Switch RCD8 to automatic mode and fix the syringe to arm holder for syringe
(d) The syringe MUST be tempered to the room temperature.
(e) Select the proper program. **@mrDWL40**
(f) To set a proper thickness, press EDIT button and set a RPM of spincoating in the list No. 9, according to table below. Then, press buttons SET and VIEW. DO NOT SAVE your changes, rather make a copy of *@program*.
(g) START the program. *The process has no EBR. We do not recommend to use EBR, but if you need EBR, make and copy of program for your modifications.*
(h) After finishing the above process immediately go to the Soft bake

Resist	Thickness (µm)	Speed rpm /ramp rpm.sec	SoftBake°C	SB Time
mr-DWL40	20	4000/500	50-90 °C	~20min
mr-DWL40	40	3200/500	50-90 °C	~20min
mr-DWL40	50	2500/800	50-90 °C	~20min
mr-DWL40	55	2400/800	50-90 °C	~20min
mr-DWL40	58	1900/800	50-90 °C	~20min
mr-DWL40	60	1890/800	50-90 °C	~20min
mr-DWL40	63	1880/800	50-90 °C	~20min
mr-DWL40	65	1850/800	50-90 °C	~20min

For more details about automatic deposition Spin coating in Chapter 5 - SOP - Resist deposition - RCD8

4. Soft bake

(a) Use some 8 inch bottomwafer due to absent of EBR process.
(b) Hot plate for thin resist (<100nm): 50°C, 300 sec, next ramp 8°C/min and 90°C 600 sec, use recipe **@mrDWL40 SB**
(c) Proximity mode – if necessary – Use the same temperature as previous and prolong the last time for 90°C for a double.
(d) IMPORTANT! After softbake, leave the substrate hotplate on up position pins under hotplates cover for 5 minutes. Then slightly open the cover and leave the wafer for next 5 minutes. Remove cooled wafer from bottomwafer after.
(e) Relax the wafer for 1 hour minimally!

For more details about automatic soft bake after spin-coating go Section 5.3 - Baking of the freshly spin-coated wafer (Soft-bake) SOP - Resist deposition - RCD8

5. Thickness check – reflectometry (Optional)

(a) The using of halogen lamp is not necessary
(b) Use the proper Cauchy parameters for fitting or use the mrDWL models in library
(c) Use the proper substrate to background detection
(d) Check the thickness in the center and edge of your sample to confirm right spin coating
(e) For more details about automatic reflectometry check – Quick guide for reflectometry.

UV lithography Technical Notes - details in UV lithography SOP

(a) The process for mask aligner is optimized for first mask only
(b) Use **CF Nano mrDWL40 FM** recipe, decrease the WEC pressure to 3.0. (Red mode, you will have to confirmed it)
(c) Use the dose 300 mJ/cm.
(d) Go to PostExposure Bake

PostExposure Bake

(a) Use some 8 inch bottomwafer due to absent of BSR process.
(b) Hot plate: 50 °C, 300 sec, next ramp 8 °C/min and 90 °C 600 sec, use recipe **@mrDWL40 PEB**
The structure should be visible.
(c) Proximity mode or thicker resist– if necessary – Use the same temperature as previous and prolong the 90 °C time to the double.

(d) SLOWLY COOLED DOWN. After PostExposure Bake, leave the substrate hotplate on up position pins under hotplates cover for 10 minutes. Then, slightly open the cover and leave the wafer for next 5 minutes. If the bottom wafer is cool, remove your wafer from bottomwafer.
(e) Relax the wafer for 2-3 hour, 12 hour is recommended

Development

(a) Do not rebuild the RCD8, use the same configuration of the RCD8 as for the coating. The PGMEA solvent is developer!
(b) Select the proper receipt **@mrDWL40 development**.
(c) Press the button START. Developing time is 5 minutes.
(d) Use IPA syringe and clean the wafer during last step of program.

Mr-DWL40 resists can be developed using immersion, spray puddle and spray process techniques.

HardBake (Optional)

(a) Hot plate: 120 °C, 30 min, has not been tested yet.

Descum and optical check

(a) Use a DIENER O_2 plasma for descum procedure, for proper time, see the table below.
(b) For saving of small critical details, we recommend using fluorine RIE.
(c) Check the final structure.

Resist	Thickness (µm)	Time of Descum	Power
mr-DWL40	<20	Not necessary	300W
mr-DWL40	20-30	5 min	300W
mr-DWL40	30-40	10 min	300W
mr-DWL40	40-50	12 min	300W
mr-DWL40	>50	15 min	300W

Removal techniques

The removal is not easy. Use NMP ultrasonic bath, 85 °C. The removing of main part takes a long time, approximately several hour or day. After wet removal, some path of structure is visible on the surface. To clean the path, use the O_2 plasma wafer cleaning process.

Structure preservation

The structure can be preserved by PARYLEN-C deposition.