Nano@Stanford Fellowship

Alison Bick

Advisor: Tom Carver

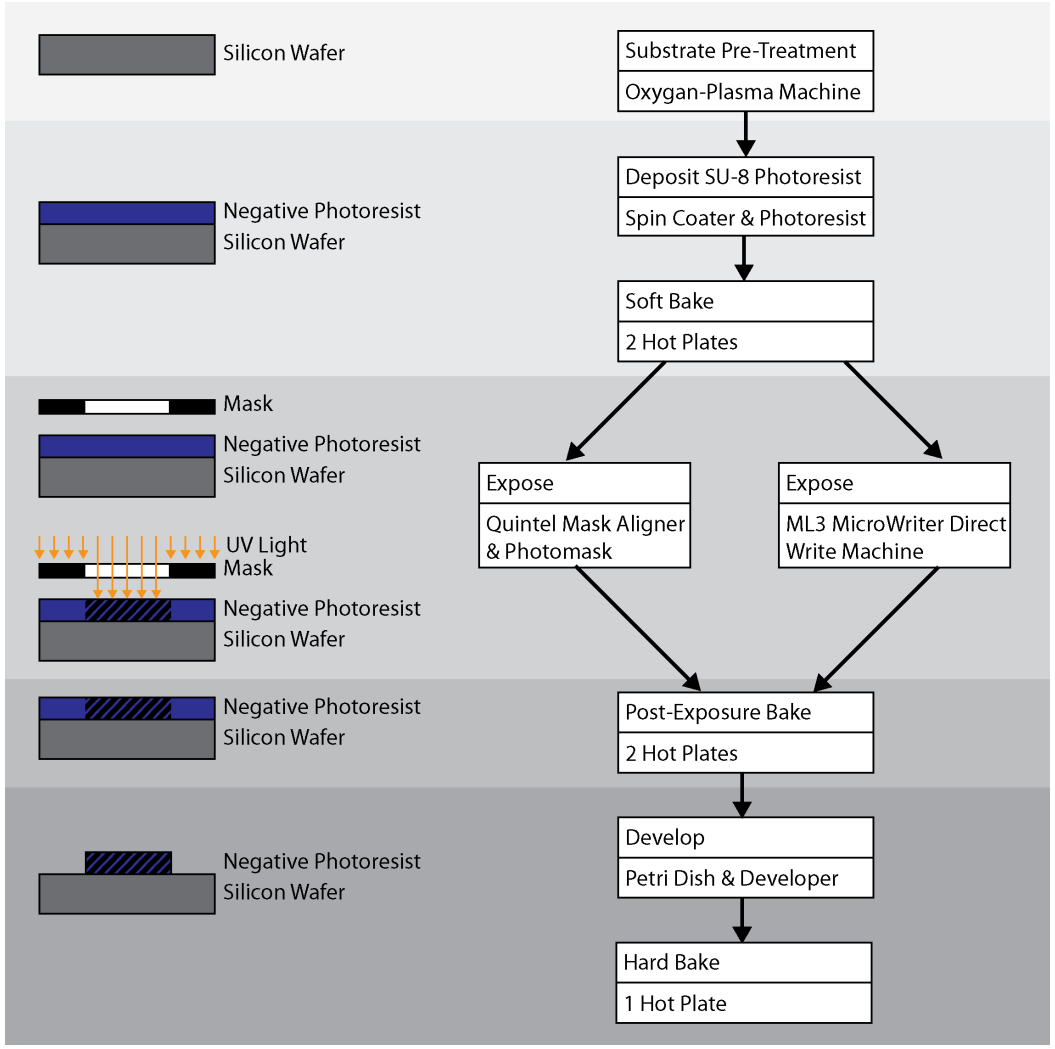
Process Overview

Part 1: Wafer Fabrication

Part 2: Microfluidic Device Manufacturing

Process Overview

Part 1: Wafer Fabrication



Part 2: Microfluidic Device Manufacturing

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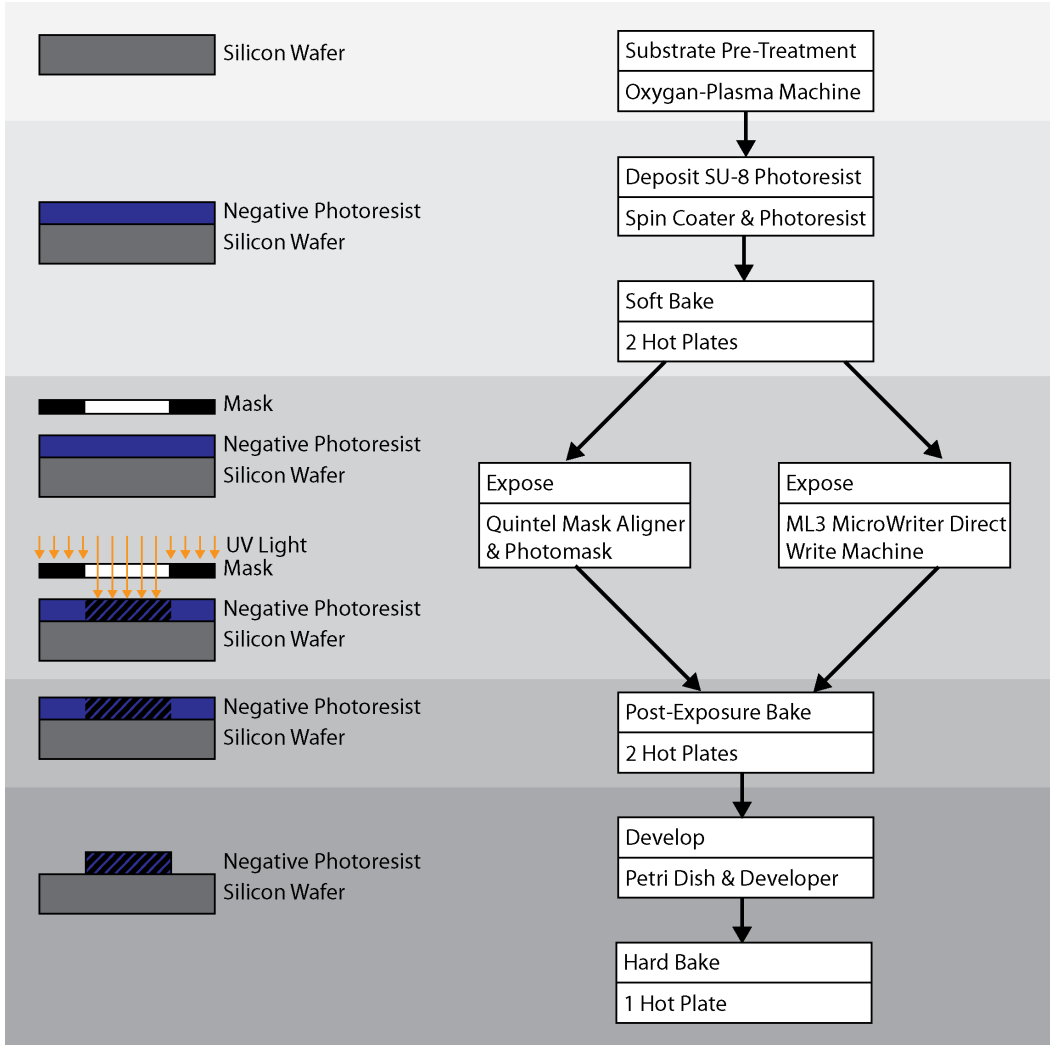
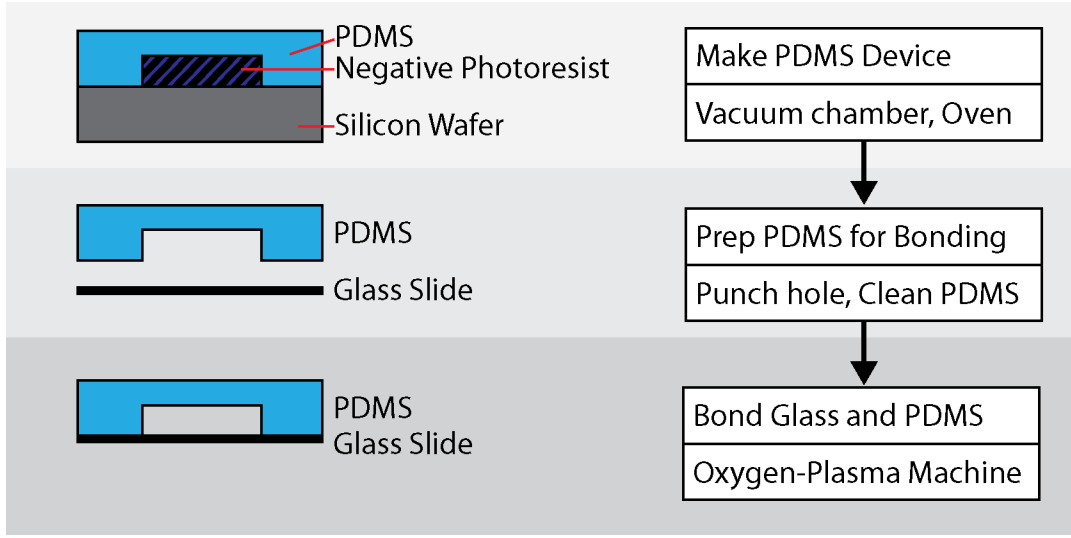
Part 1: Wafer Fabrication



Part 2: Microfluidic Device Manufacturing



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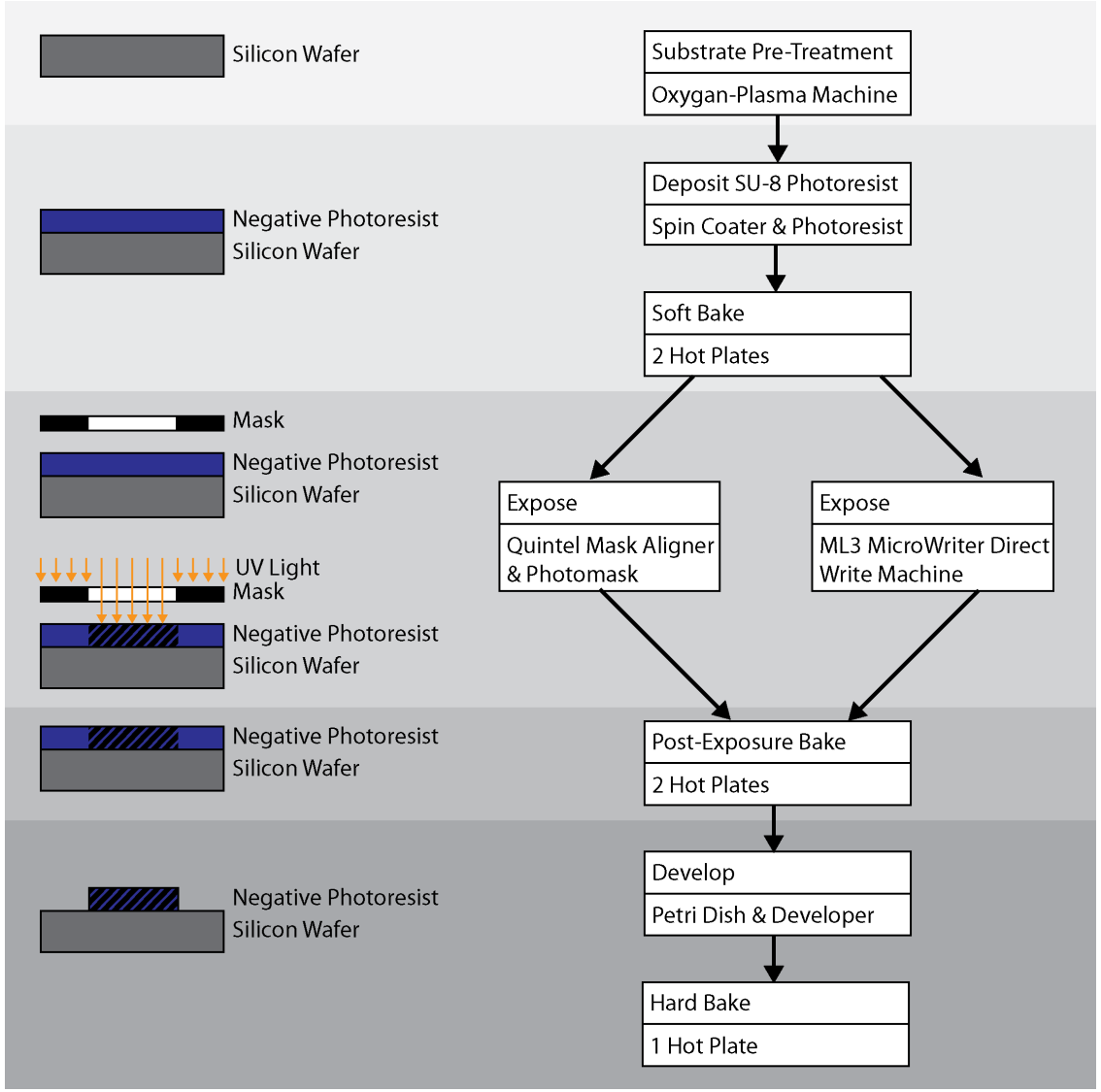

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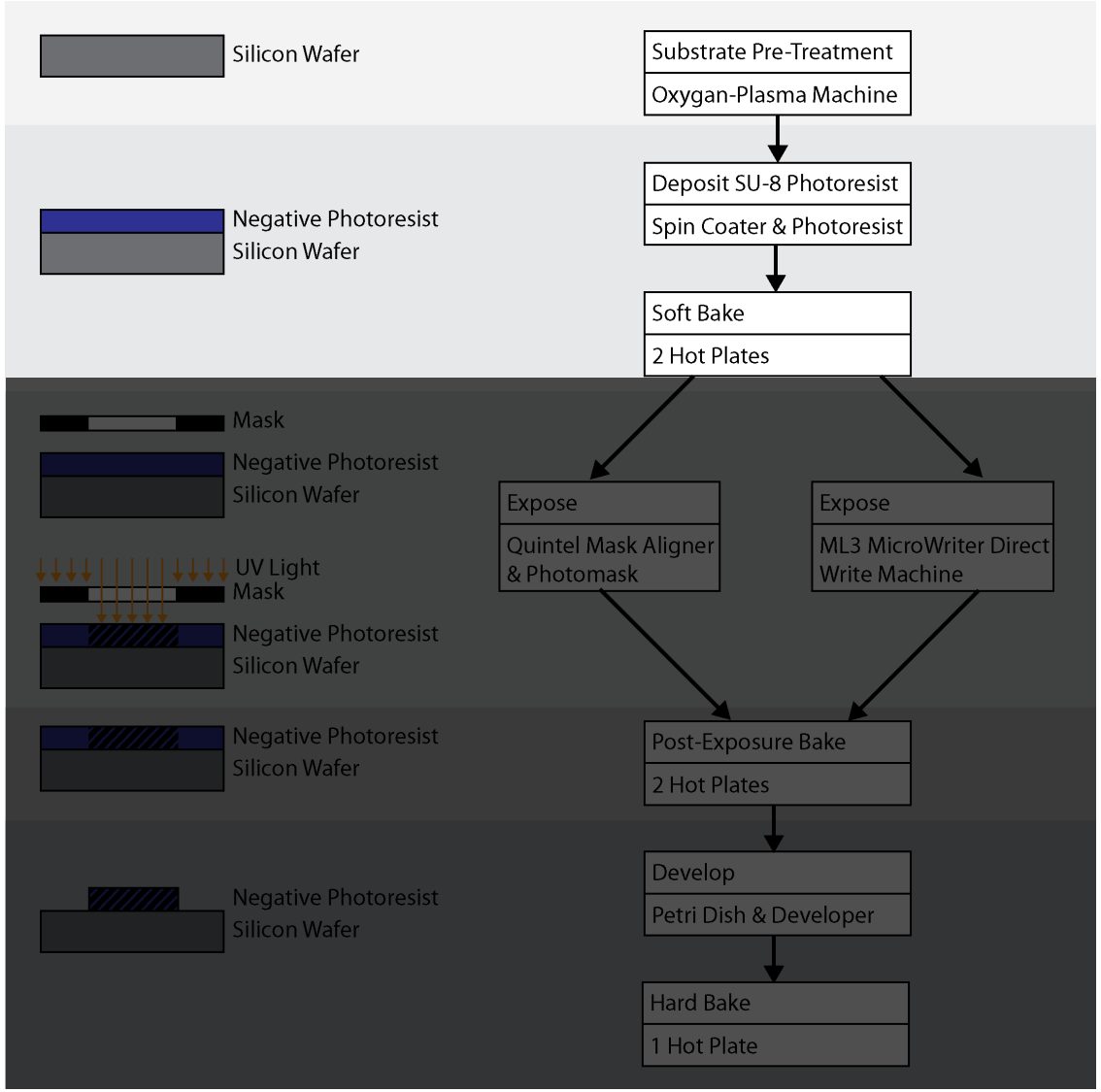

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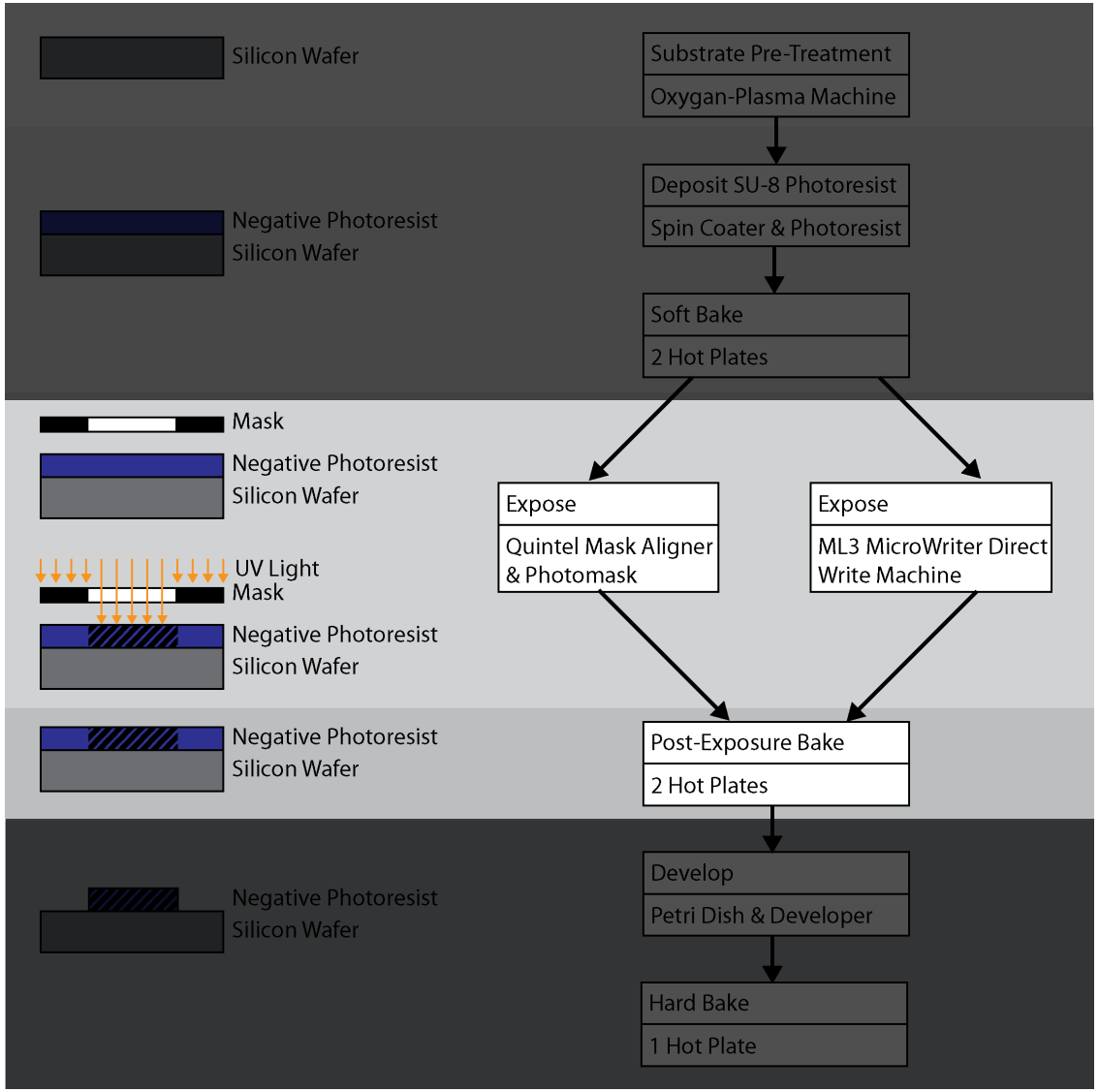

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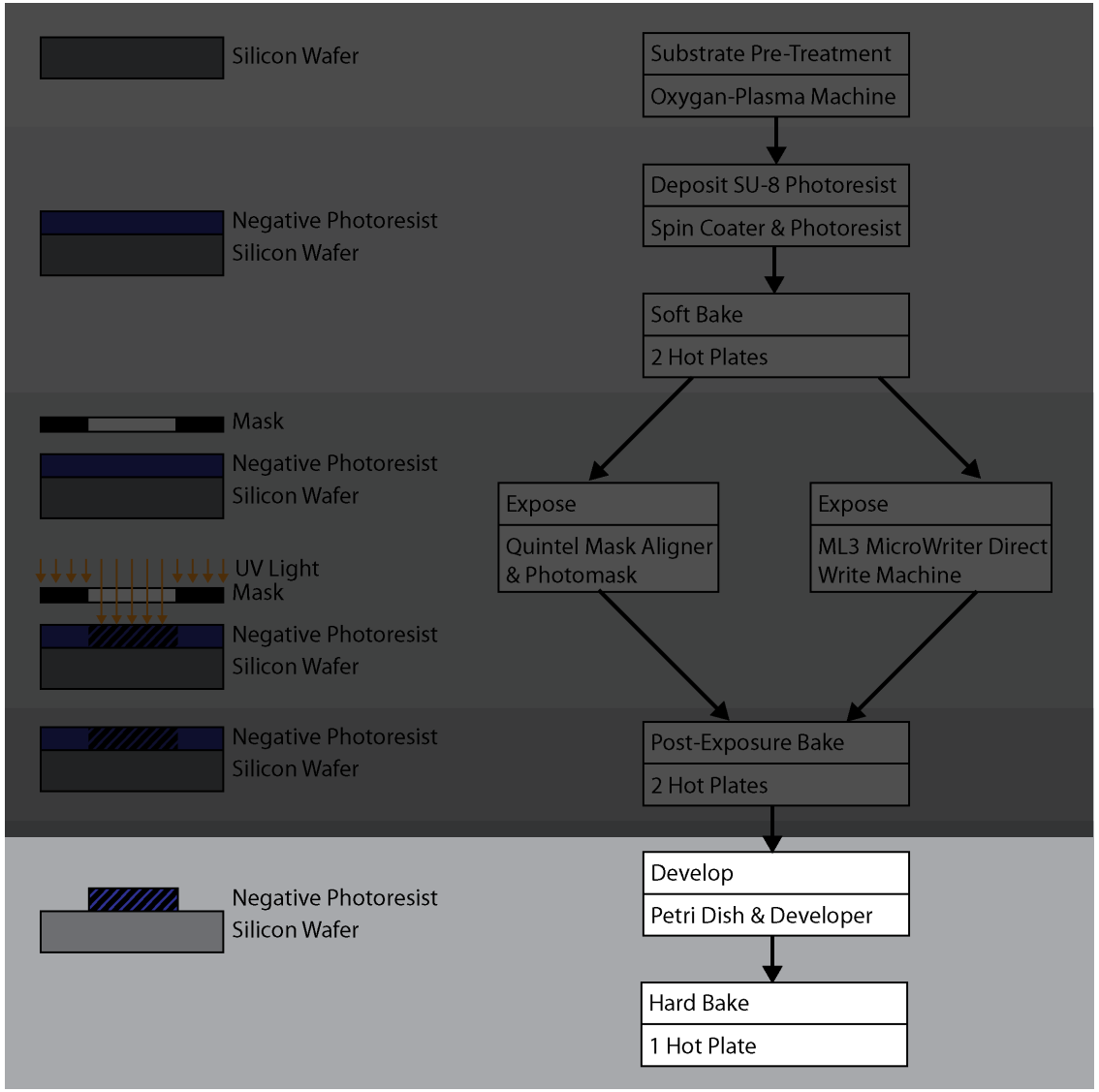

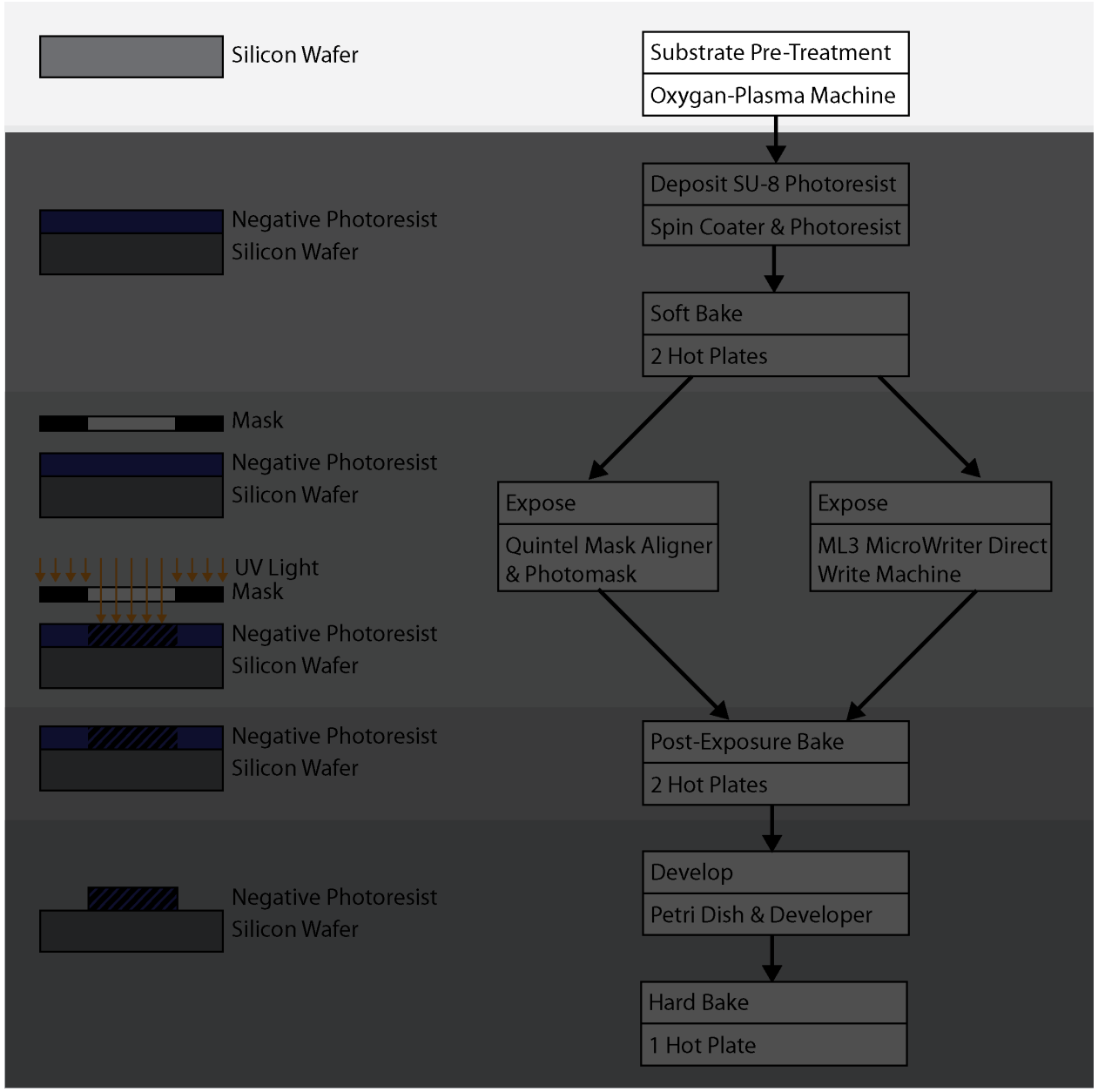
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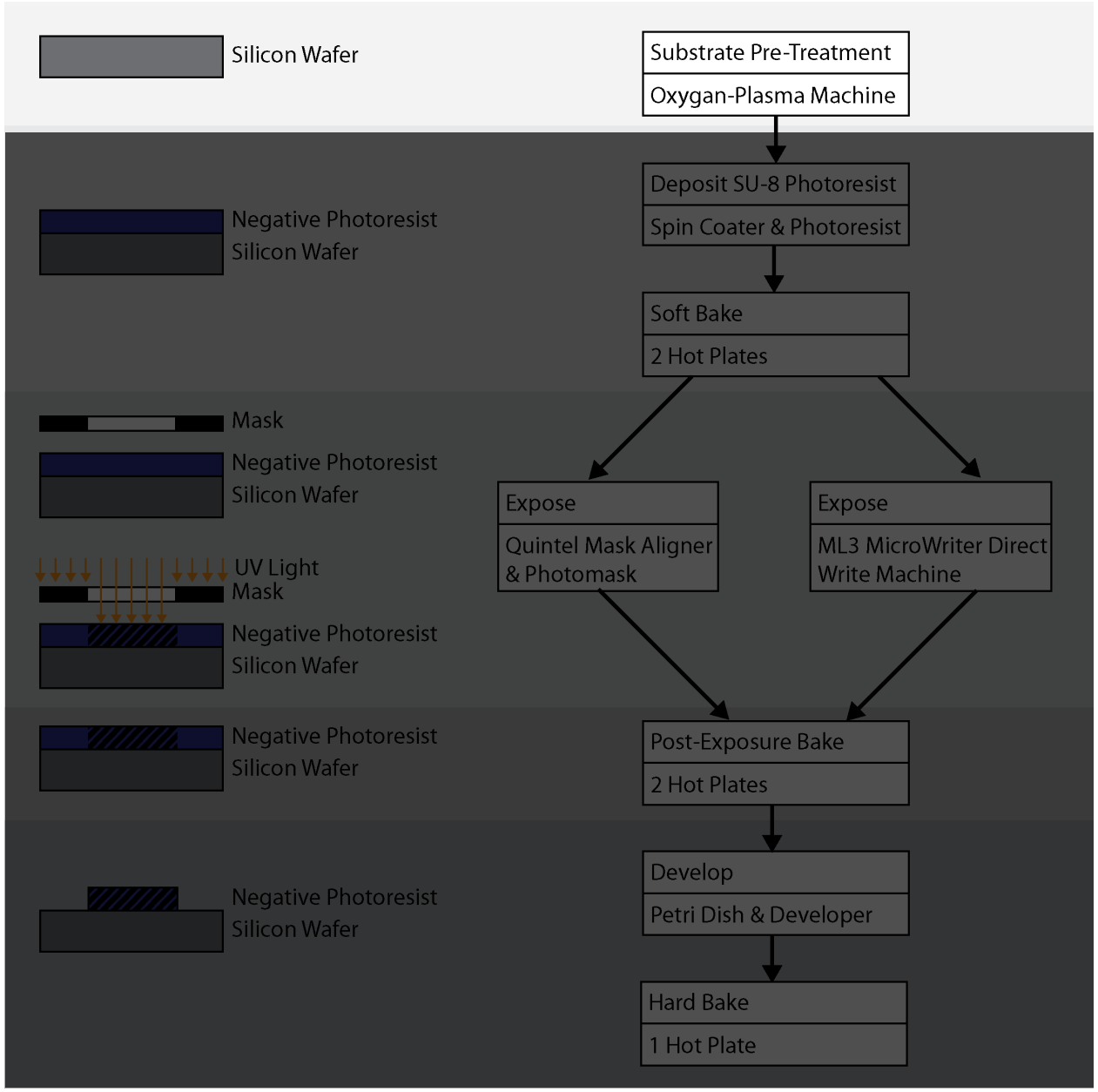
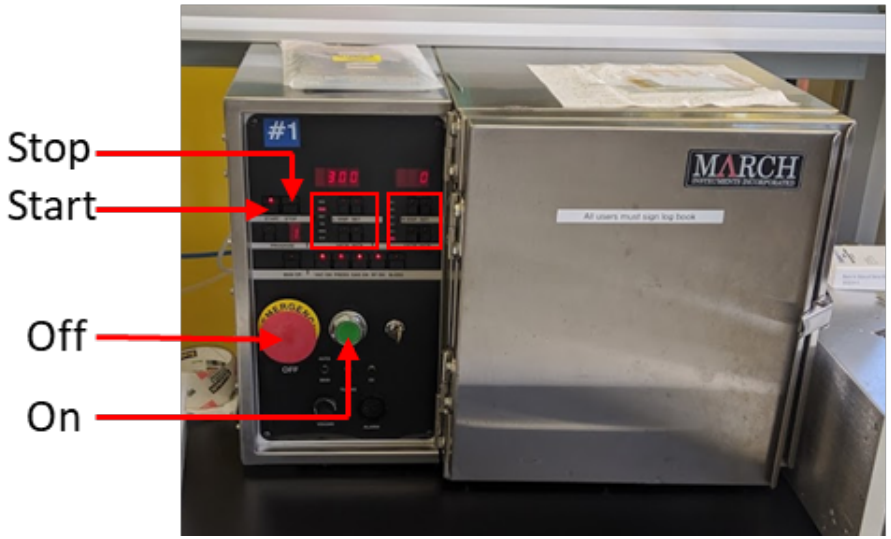
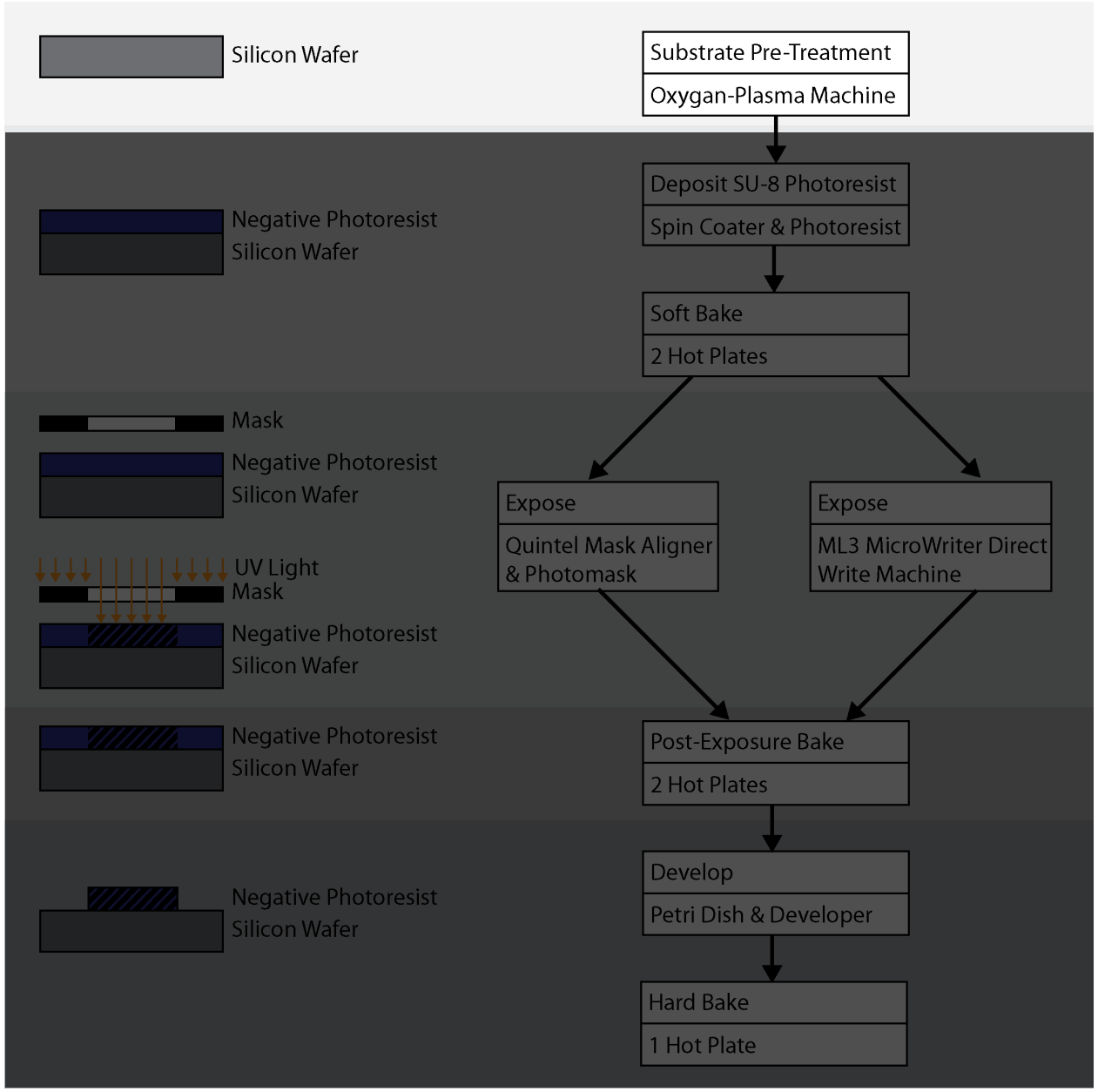


Oxygen-Plasma Cleaner





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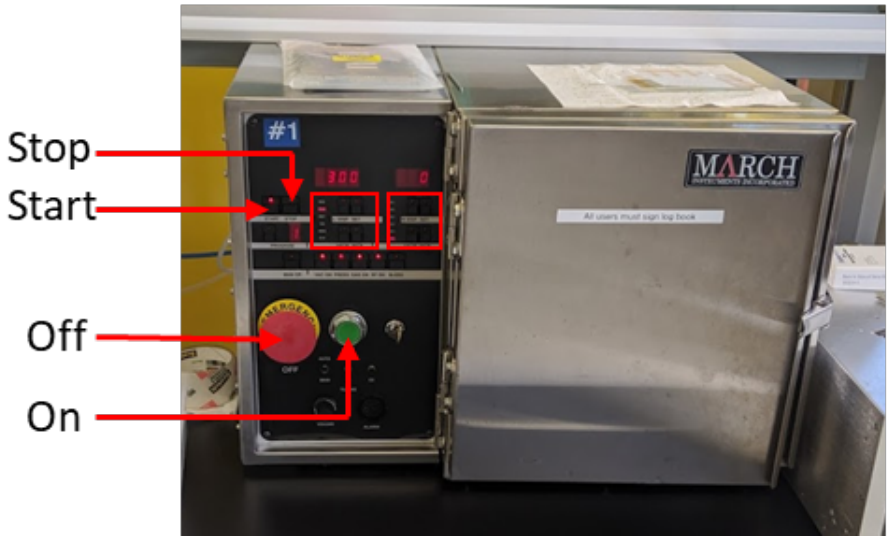

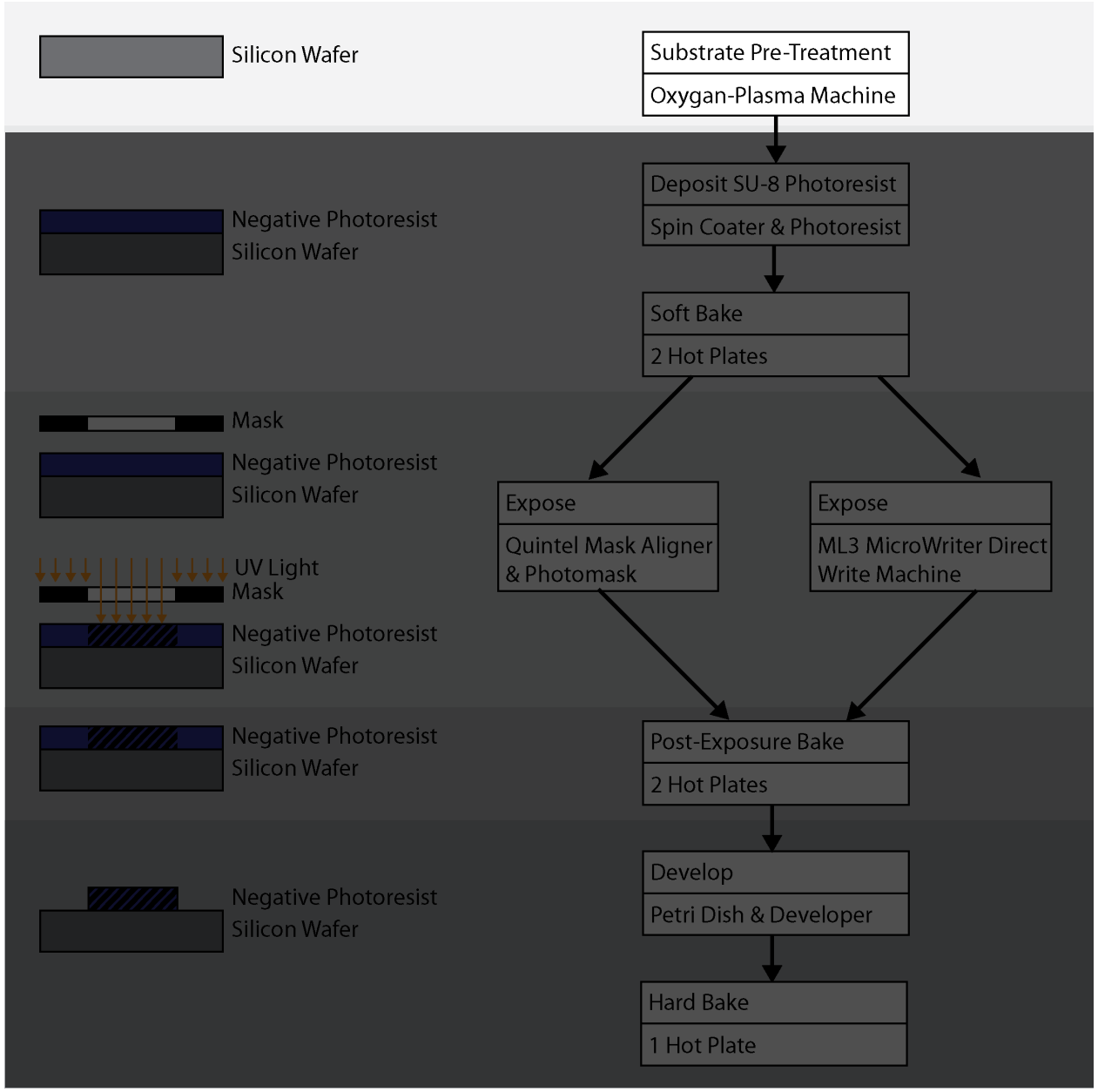

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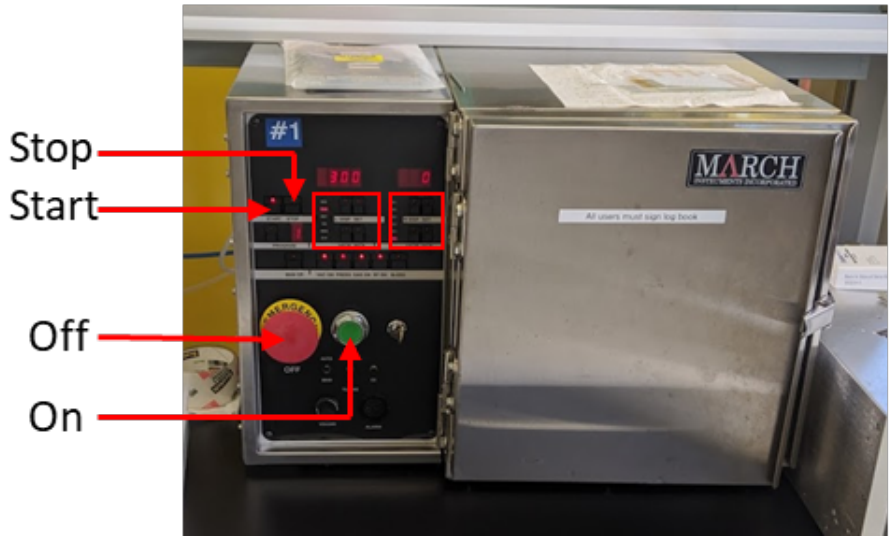


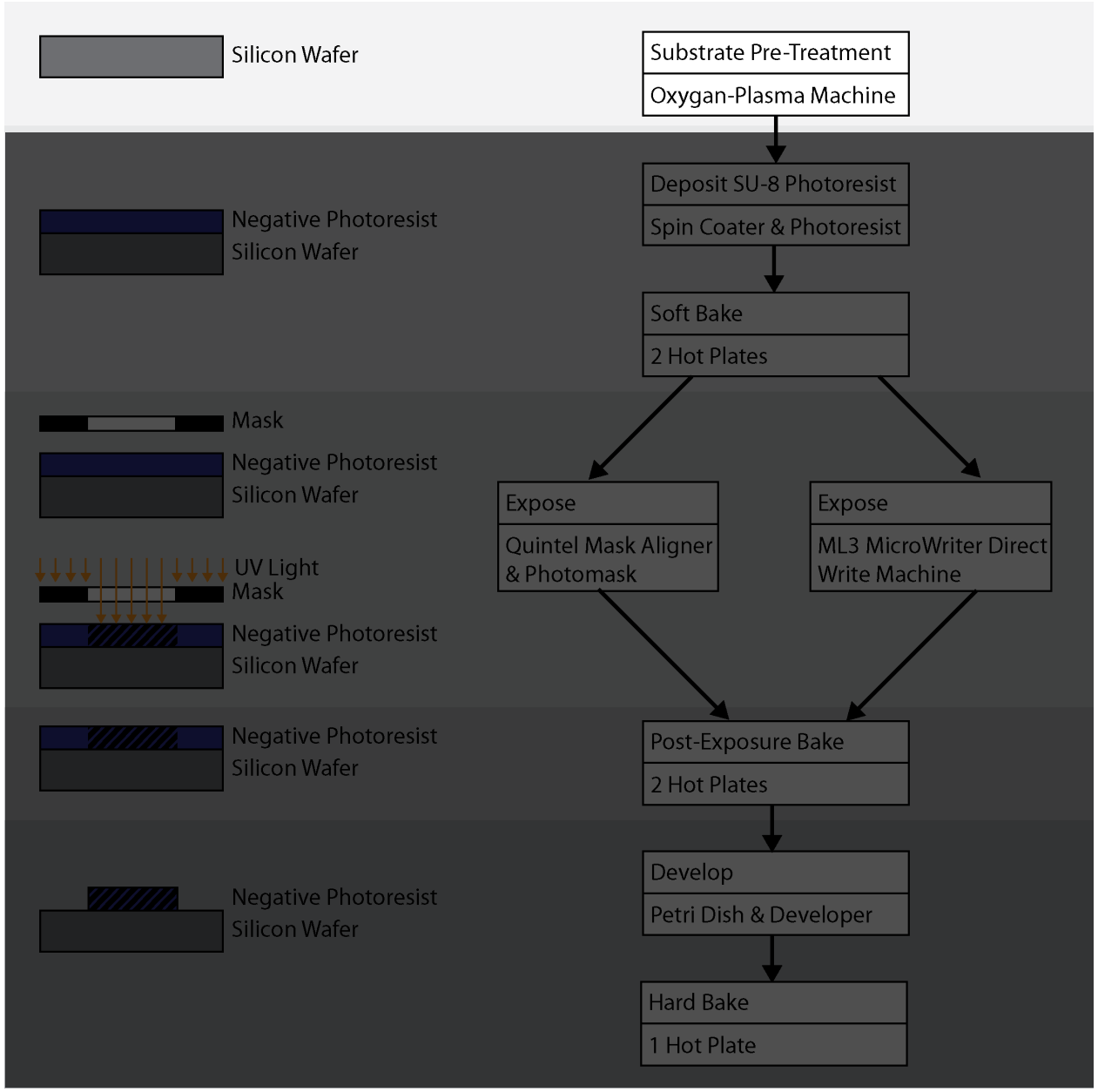
2. The desired values to treat a silicon wafer are listed below:

Parameter	PRESS	POWER	ENDPT	TIME	DCBIAS	BP/RP
Value	80	300	0	600	0	85

3. The desired values to treat a silicon wafer are listed below:

Parameter	GAS1	GAS2	GAS3	GAS4	GAS5	GAS6
Value	0	2	0	0	0	0

Note: GAS2 is oxygen, you should make sure that GAS1 (nitrogen) is turned off (0).



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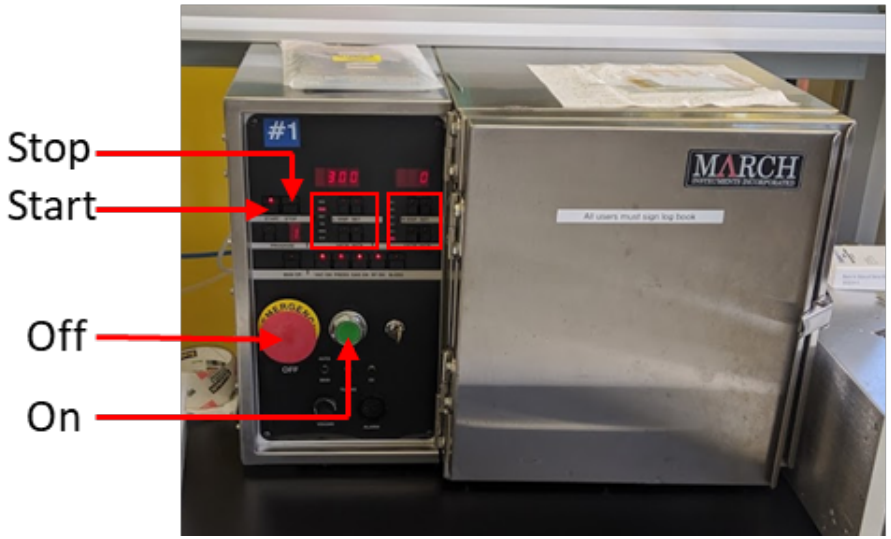

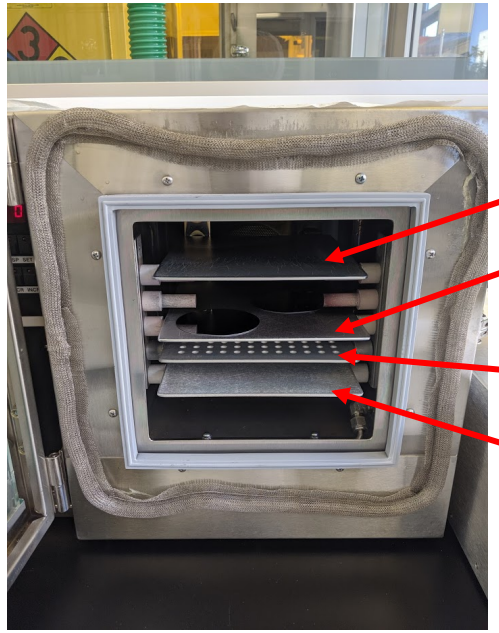

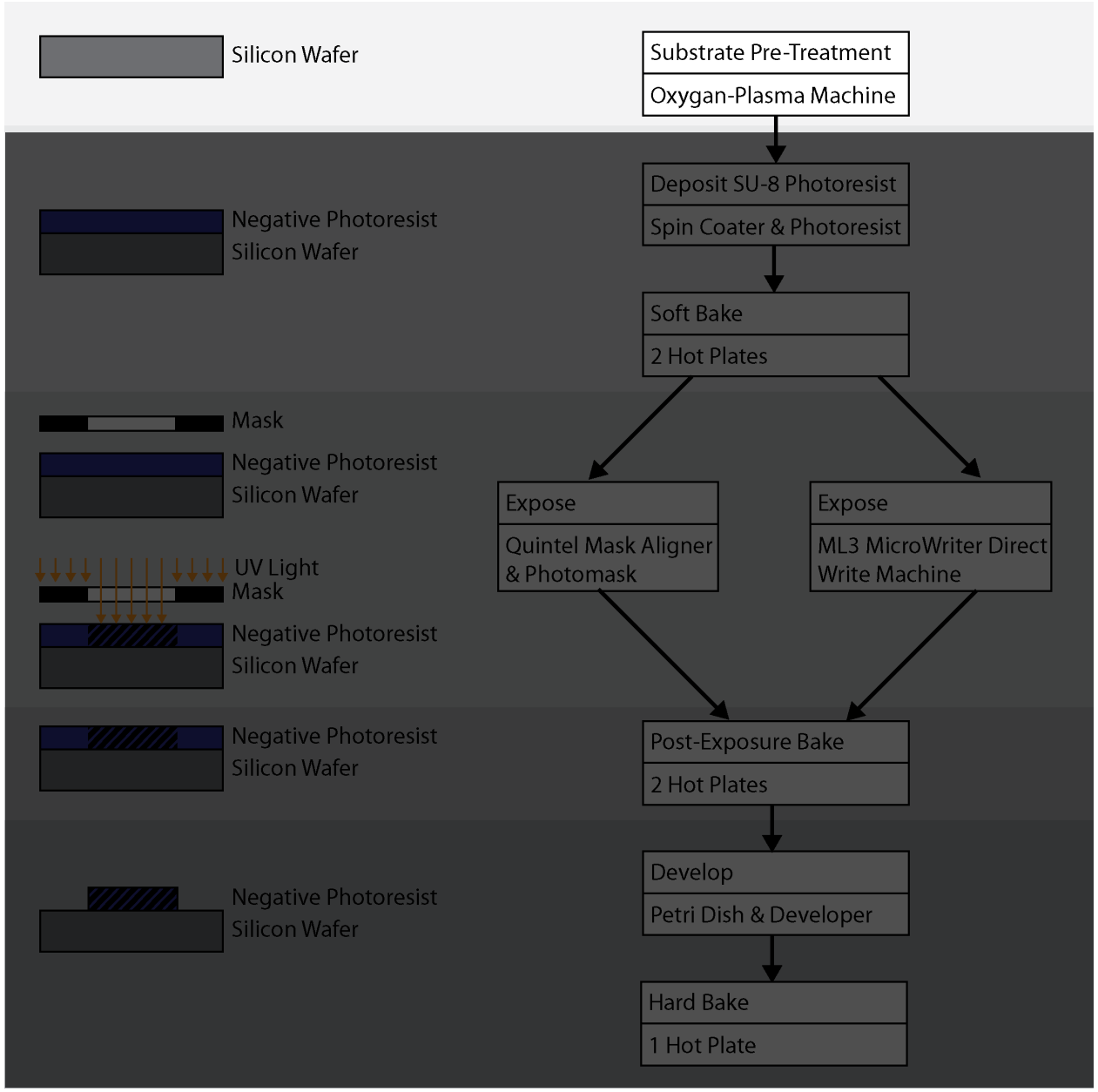

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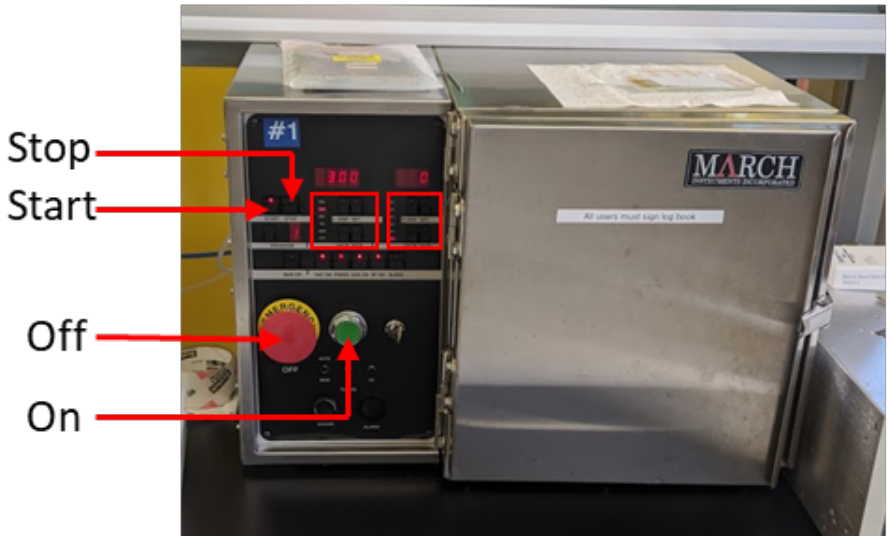

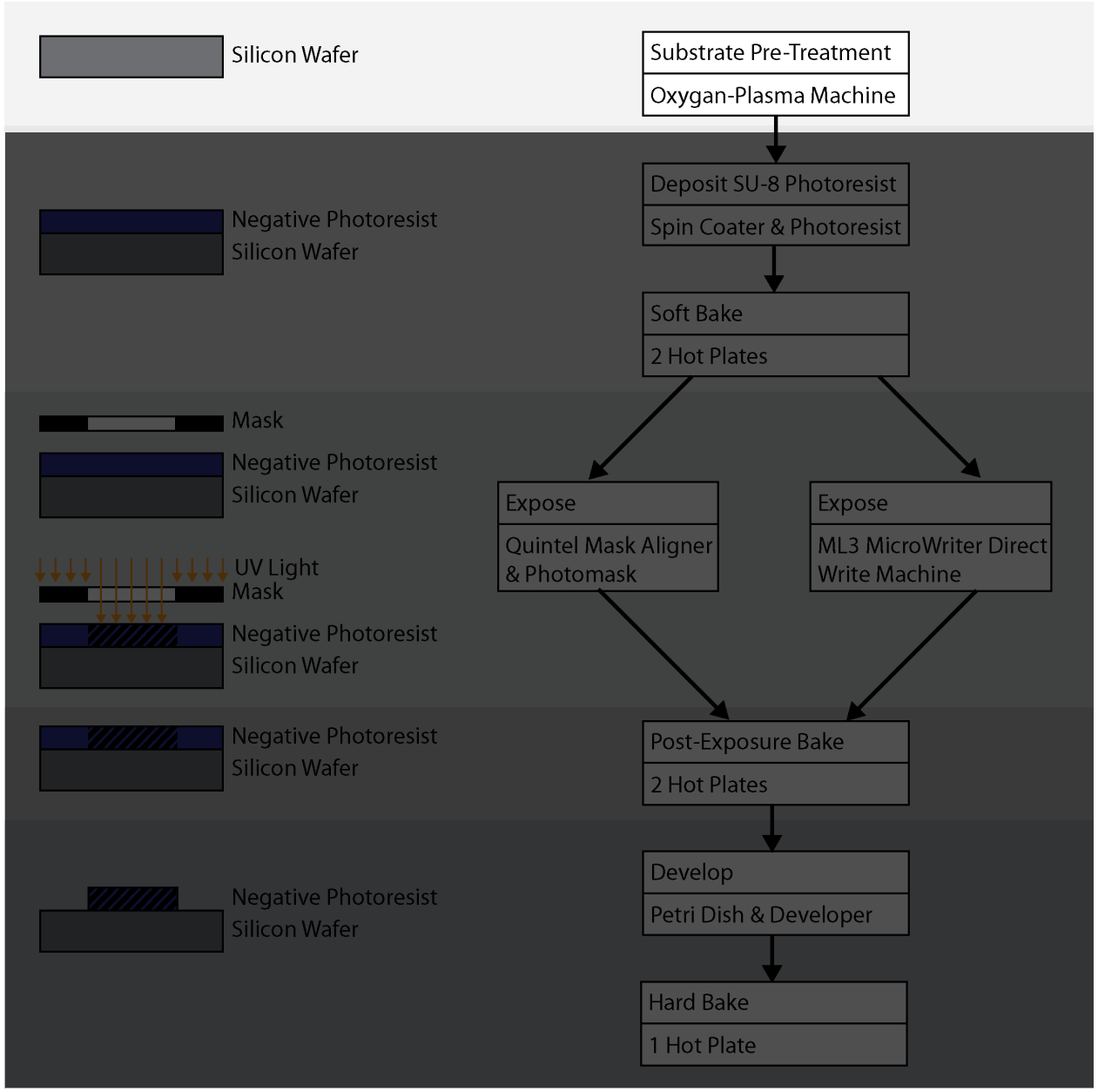

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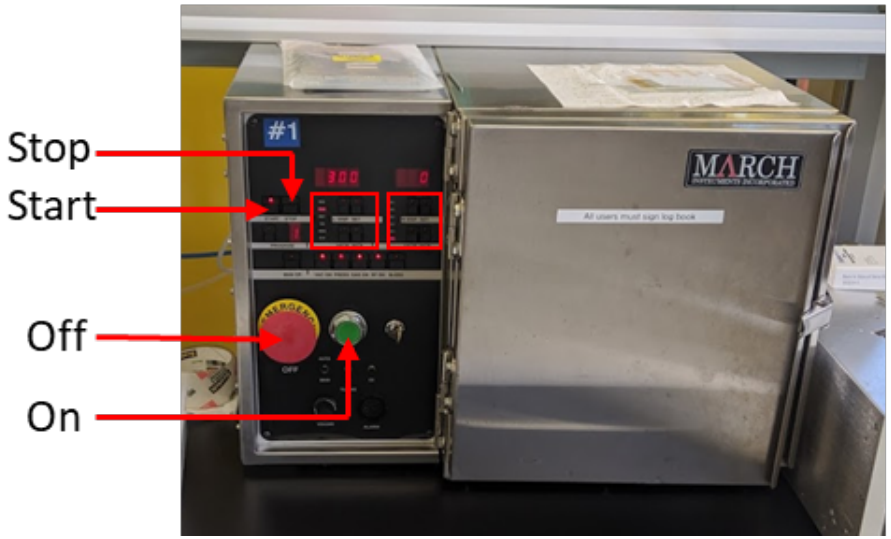

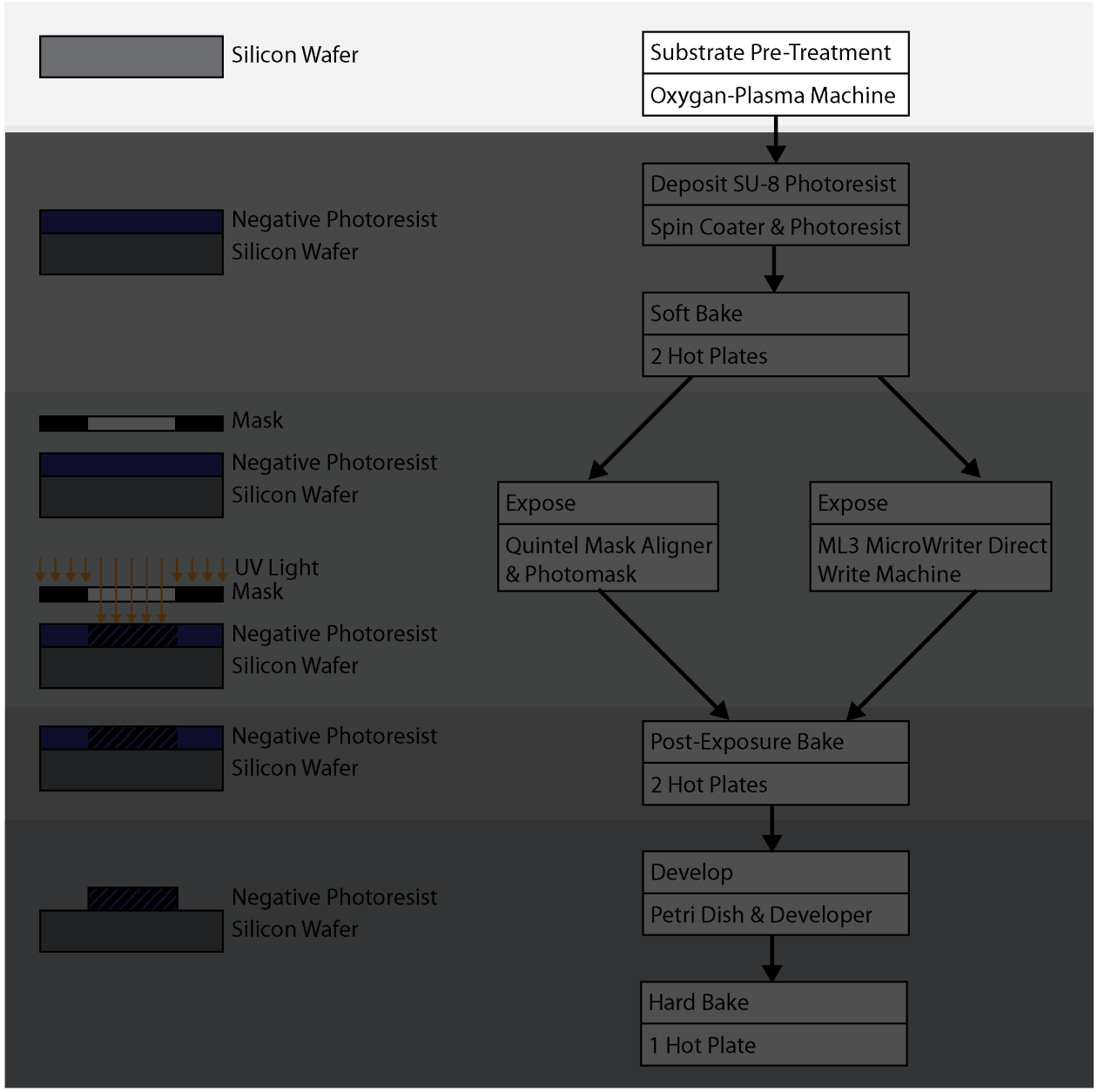

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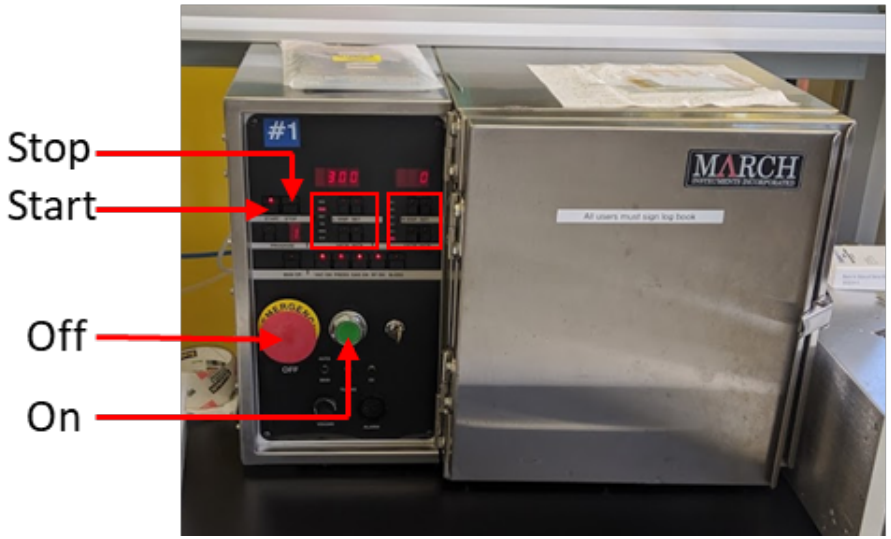

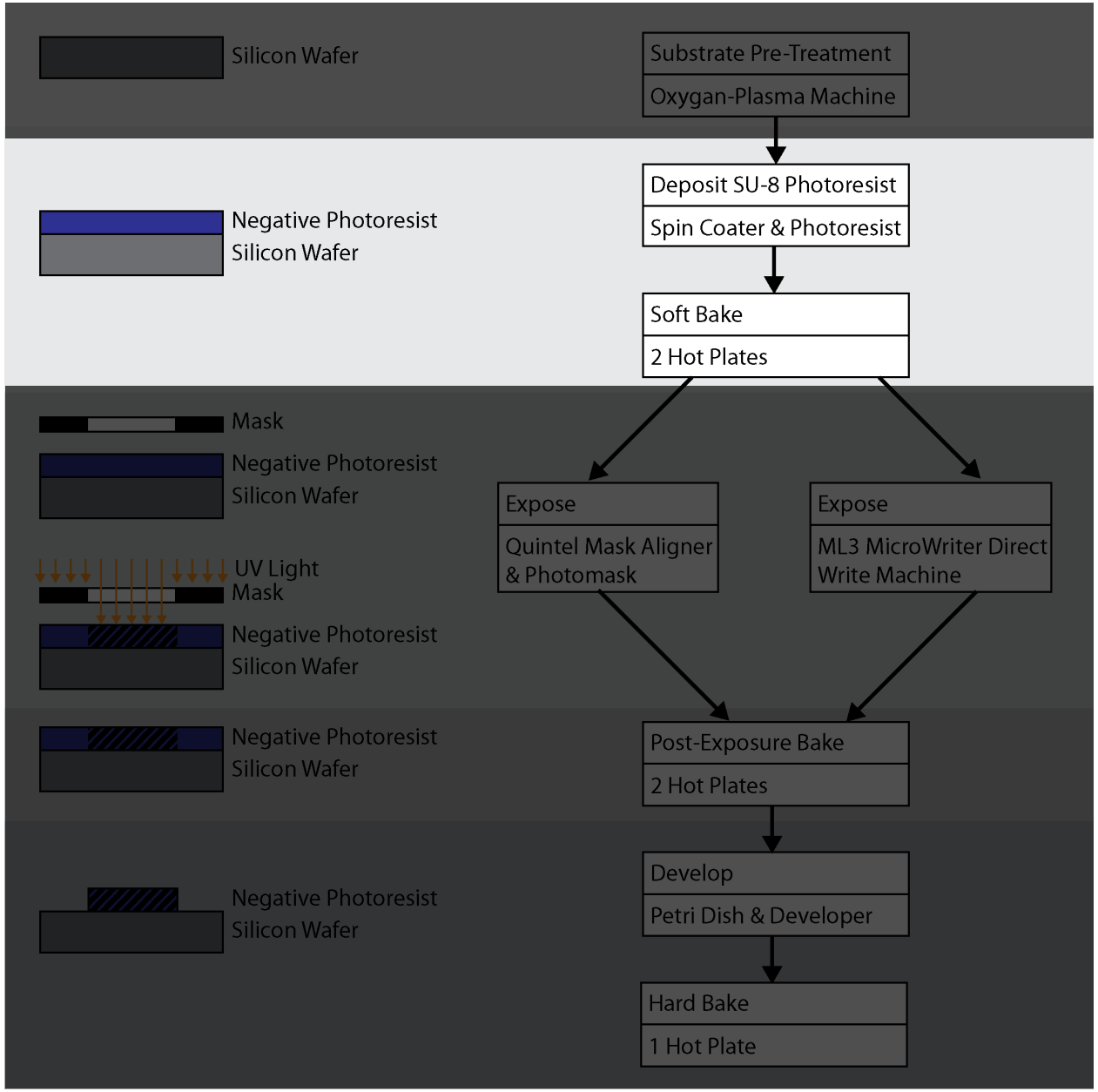
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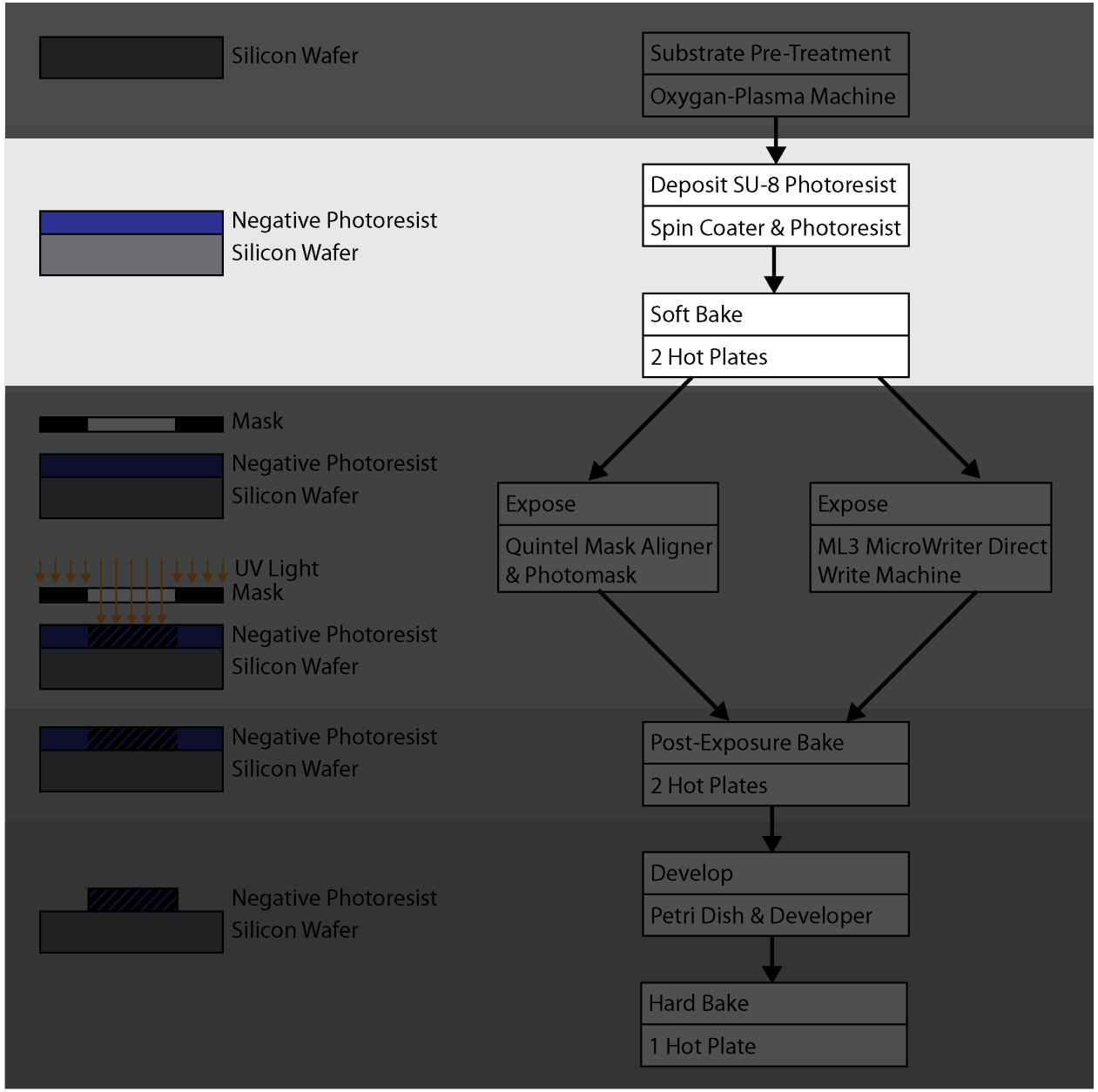
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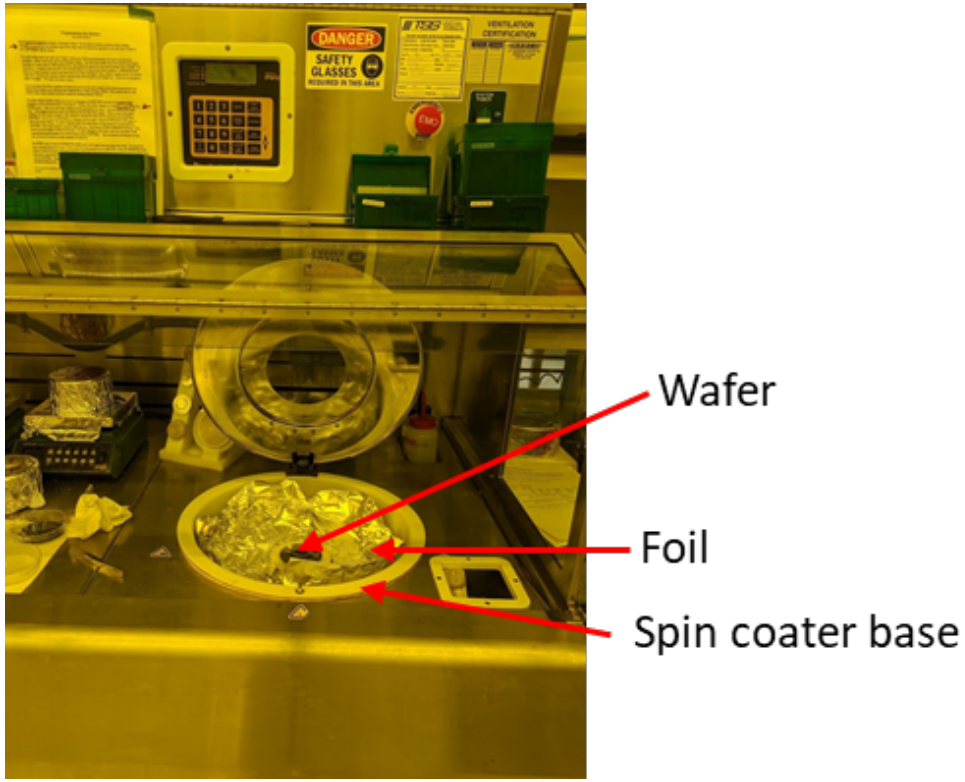
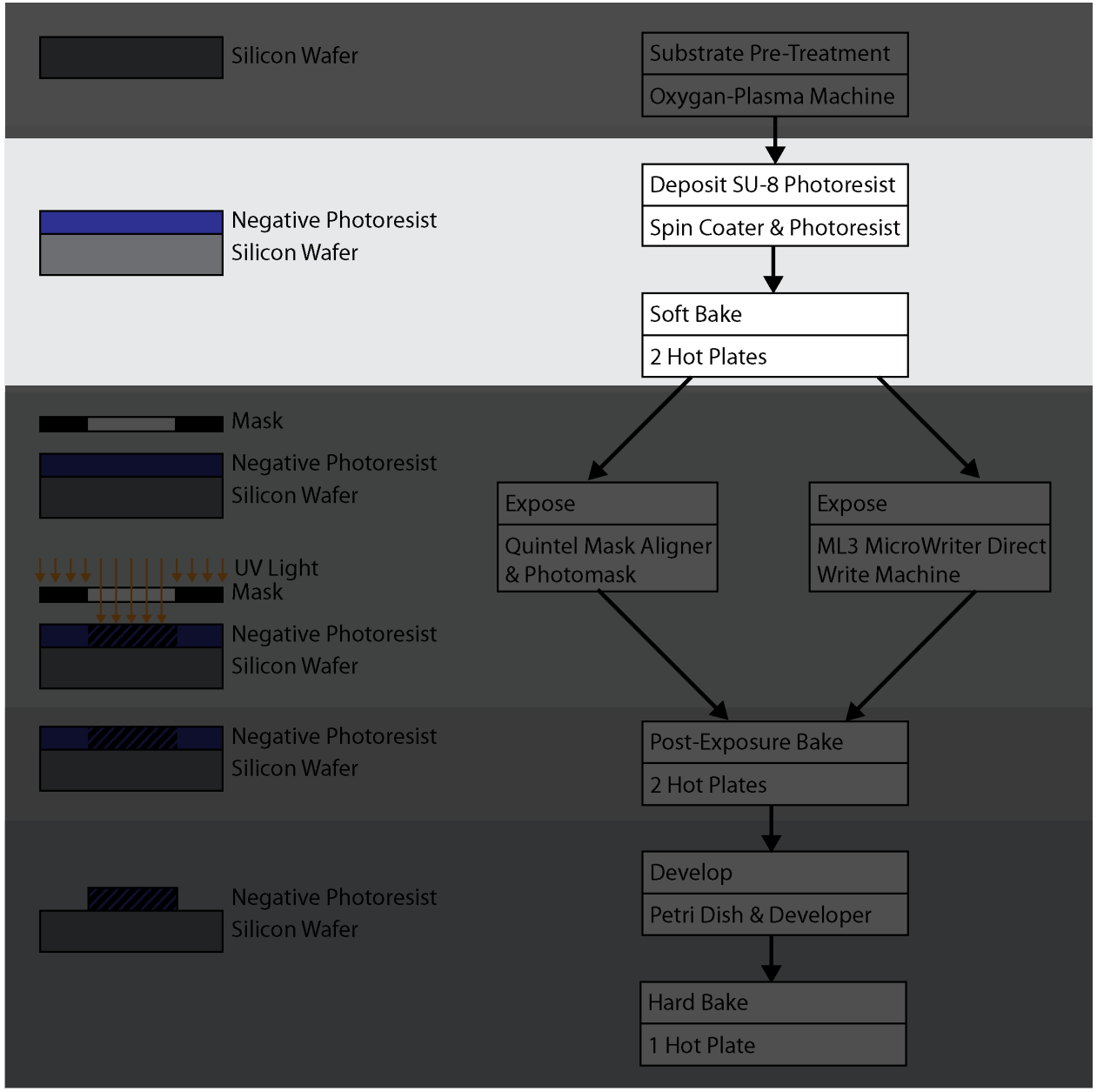

DANGER
SAFETY GLASSES
Wafer
Foil
Spin coater base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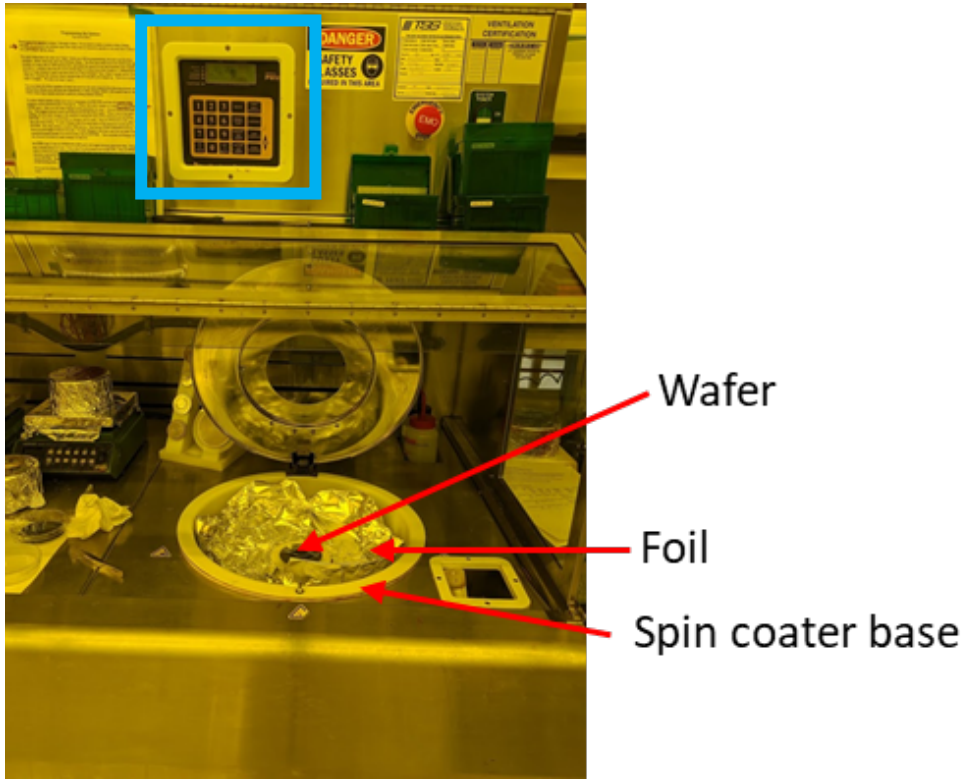
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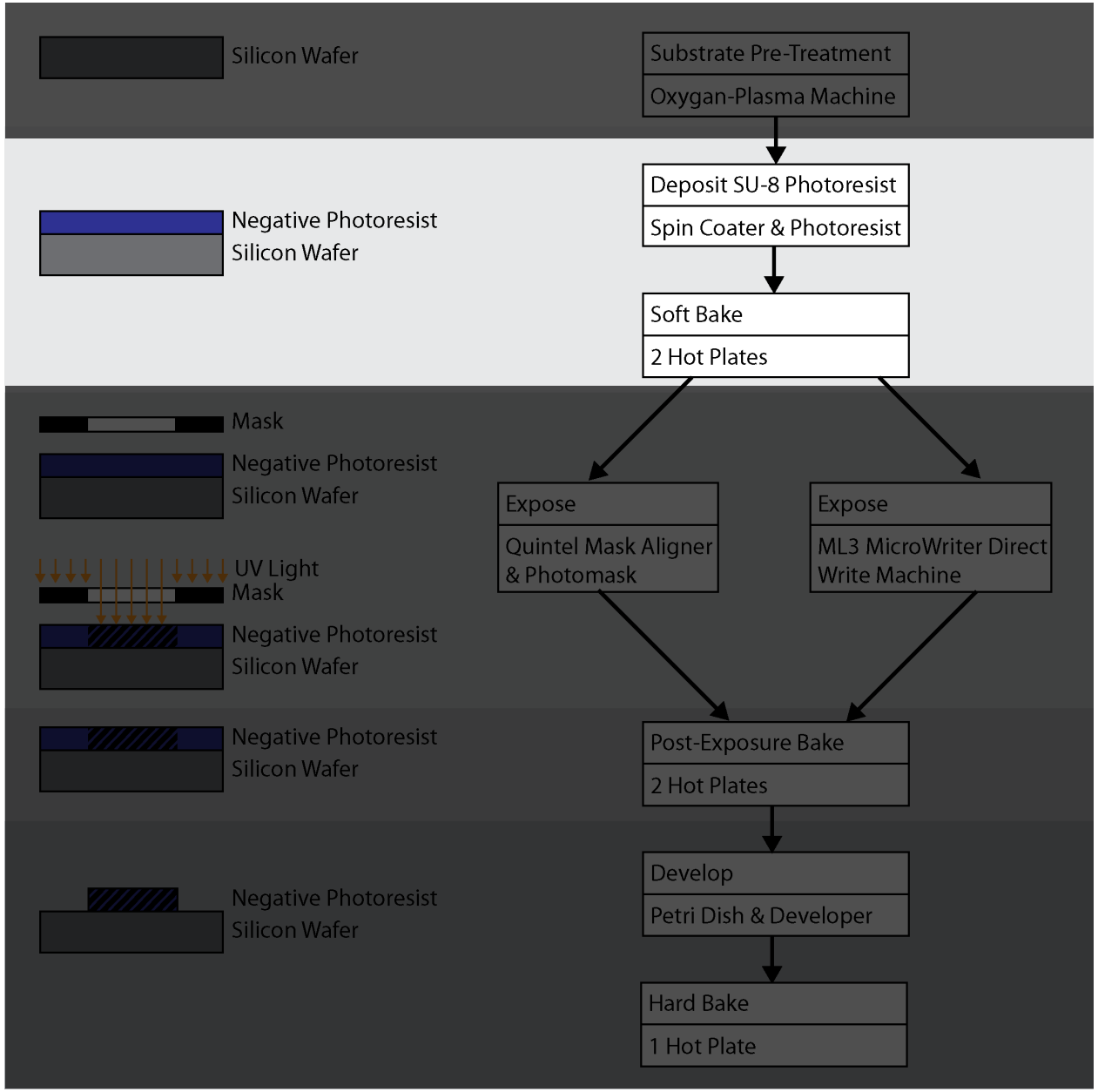
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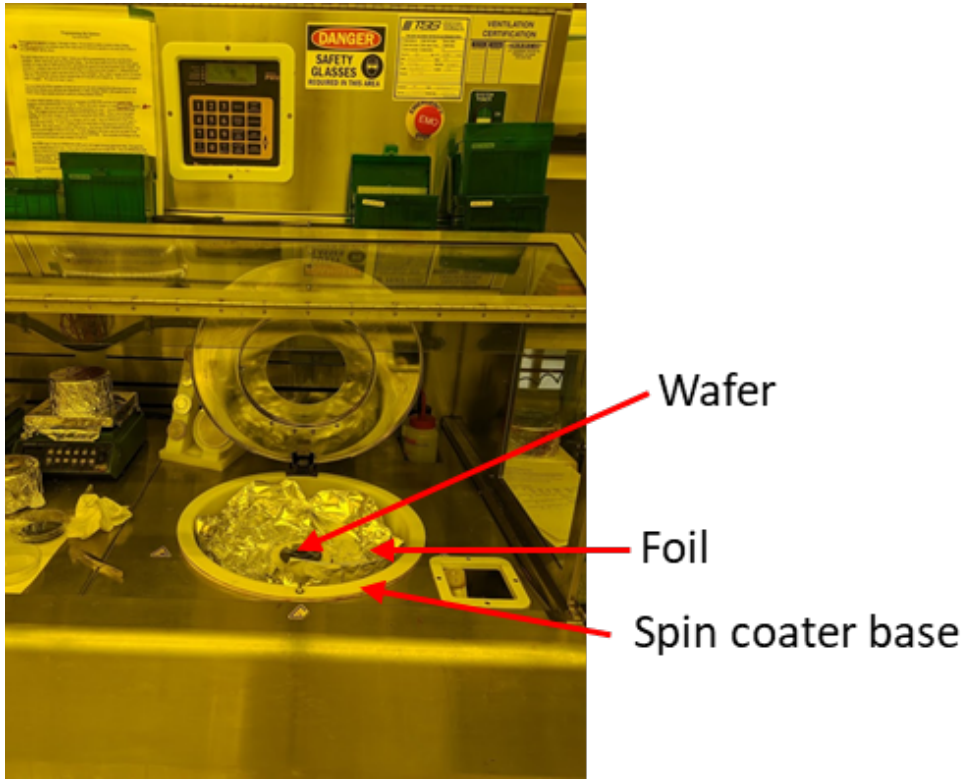
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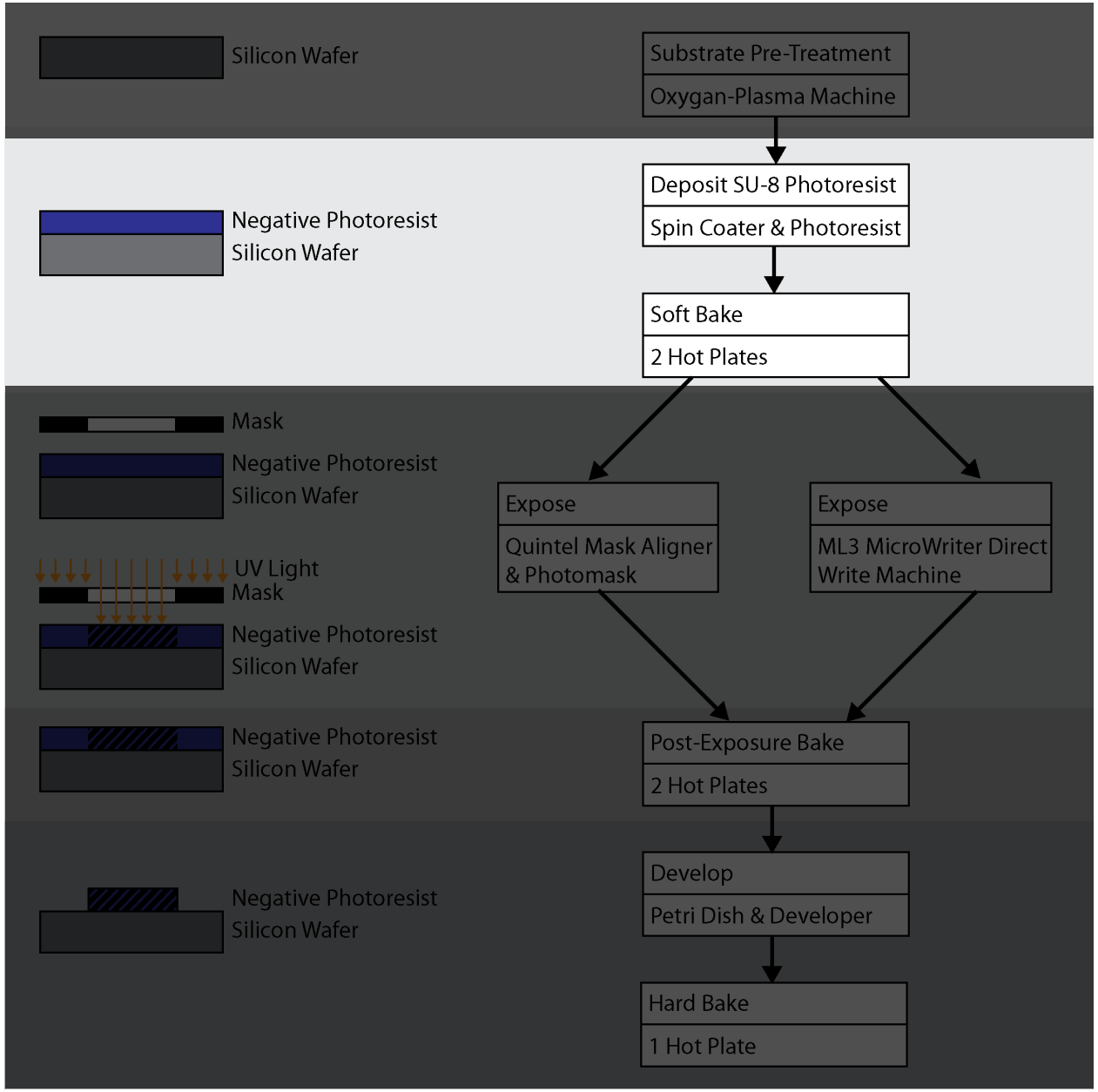
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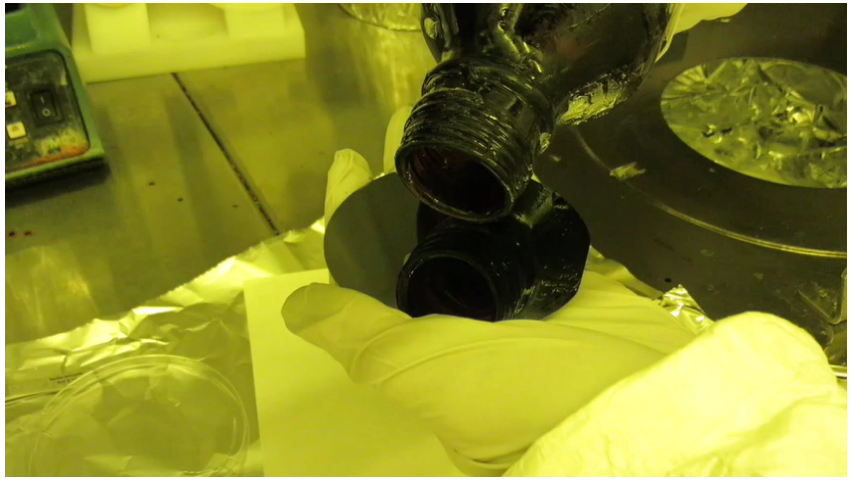

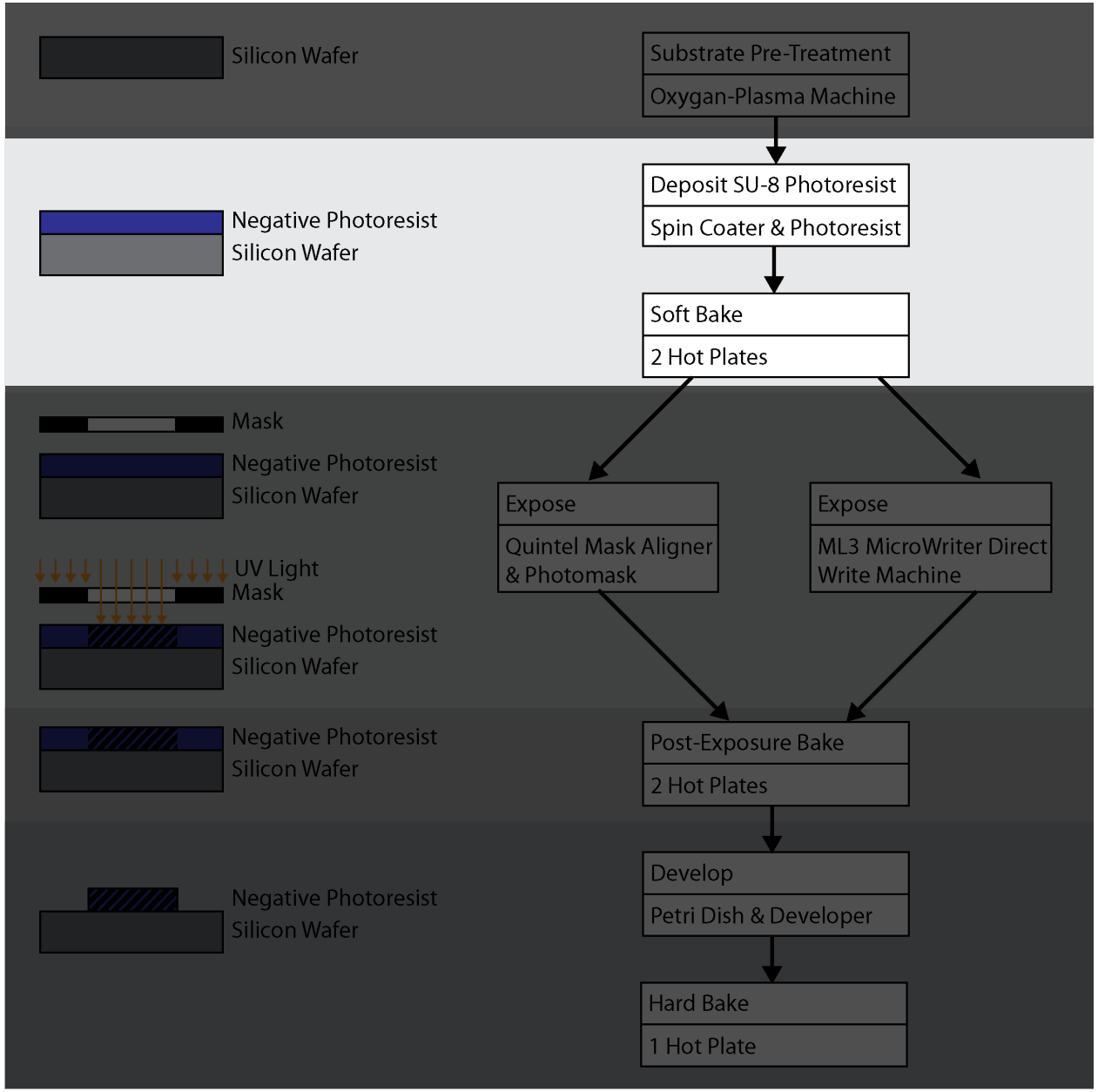
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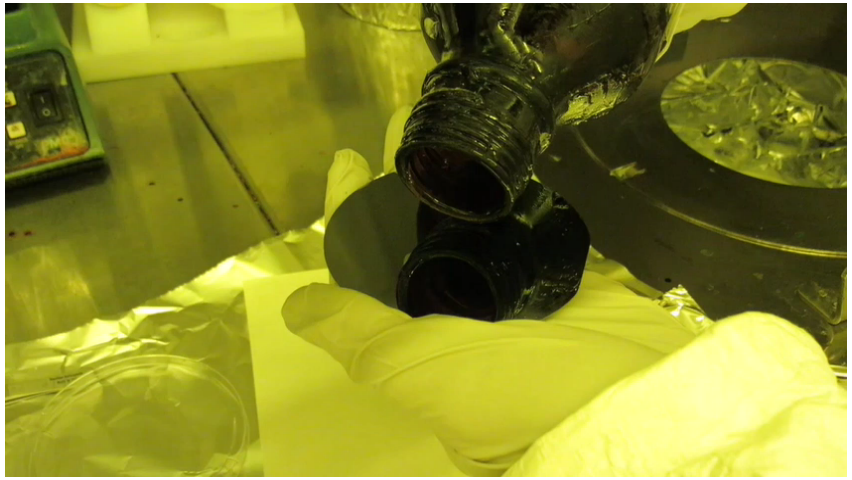
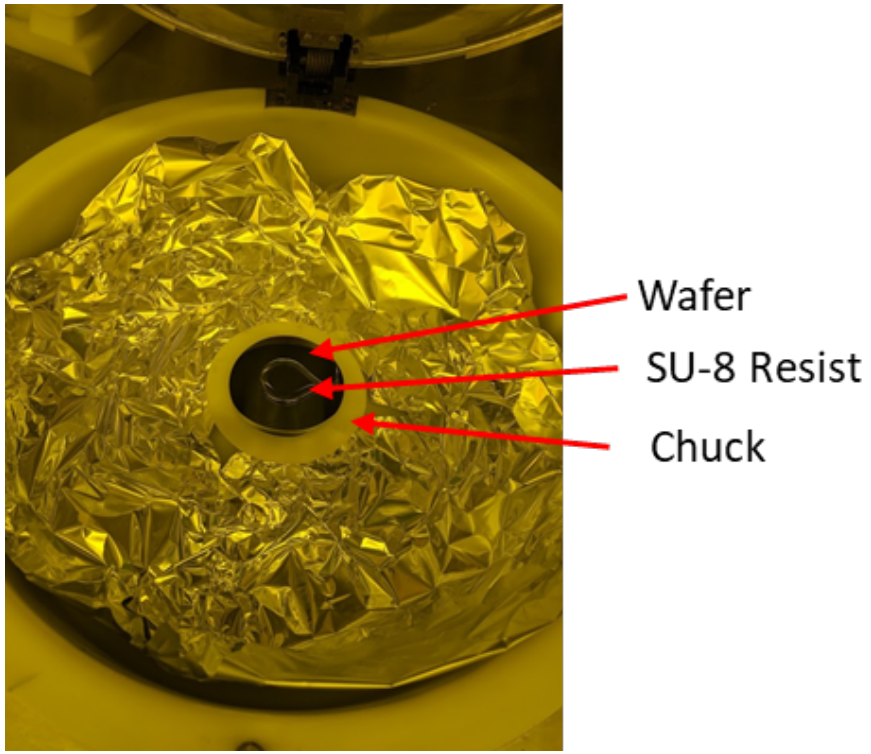
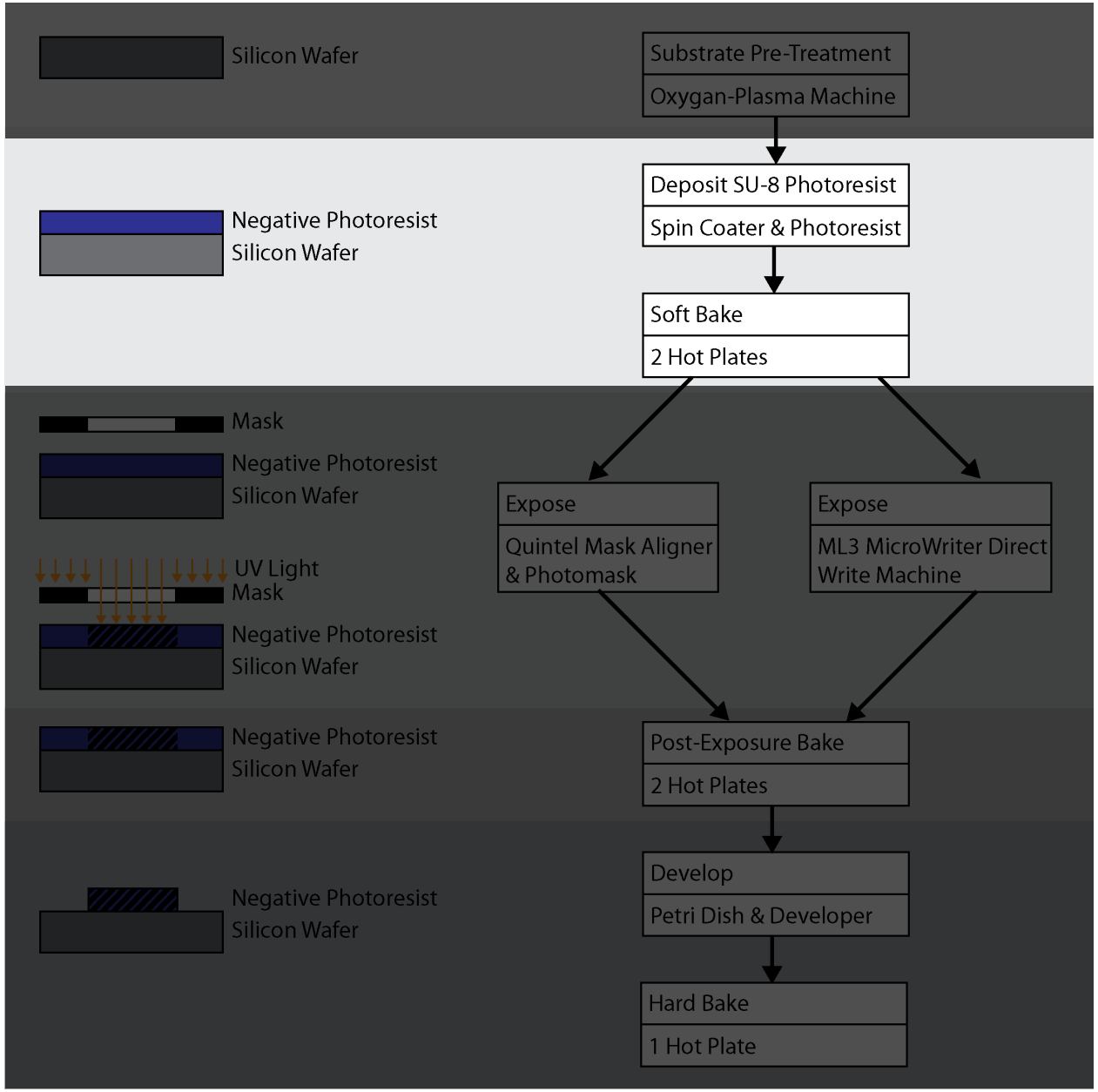



Wafer
SU-8 Resist
Chuck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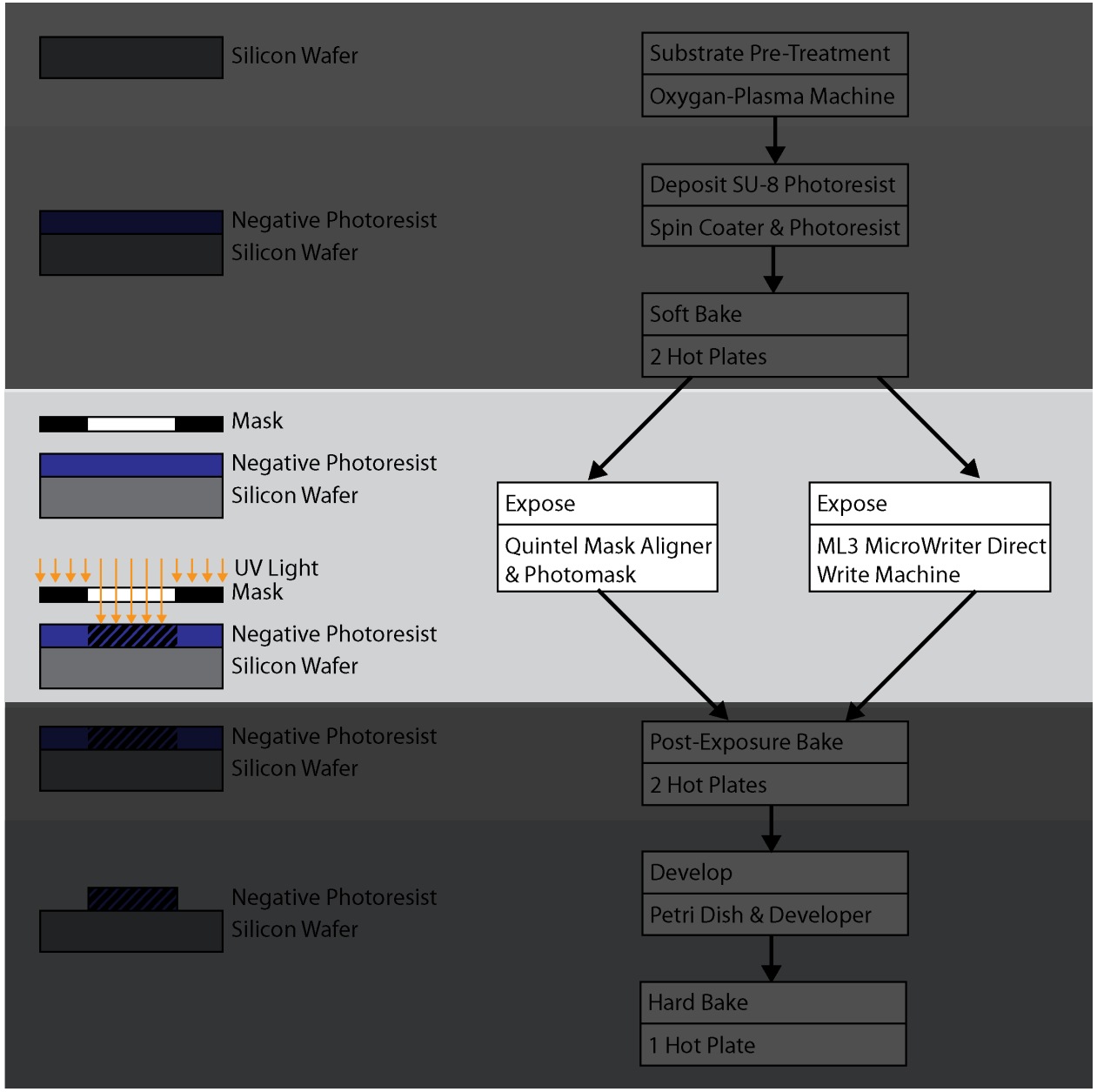
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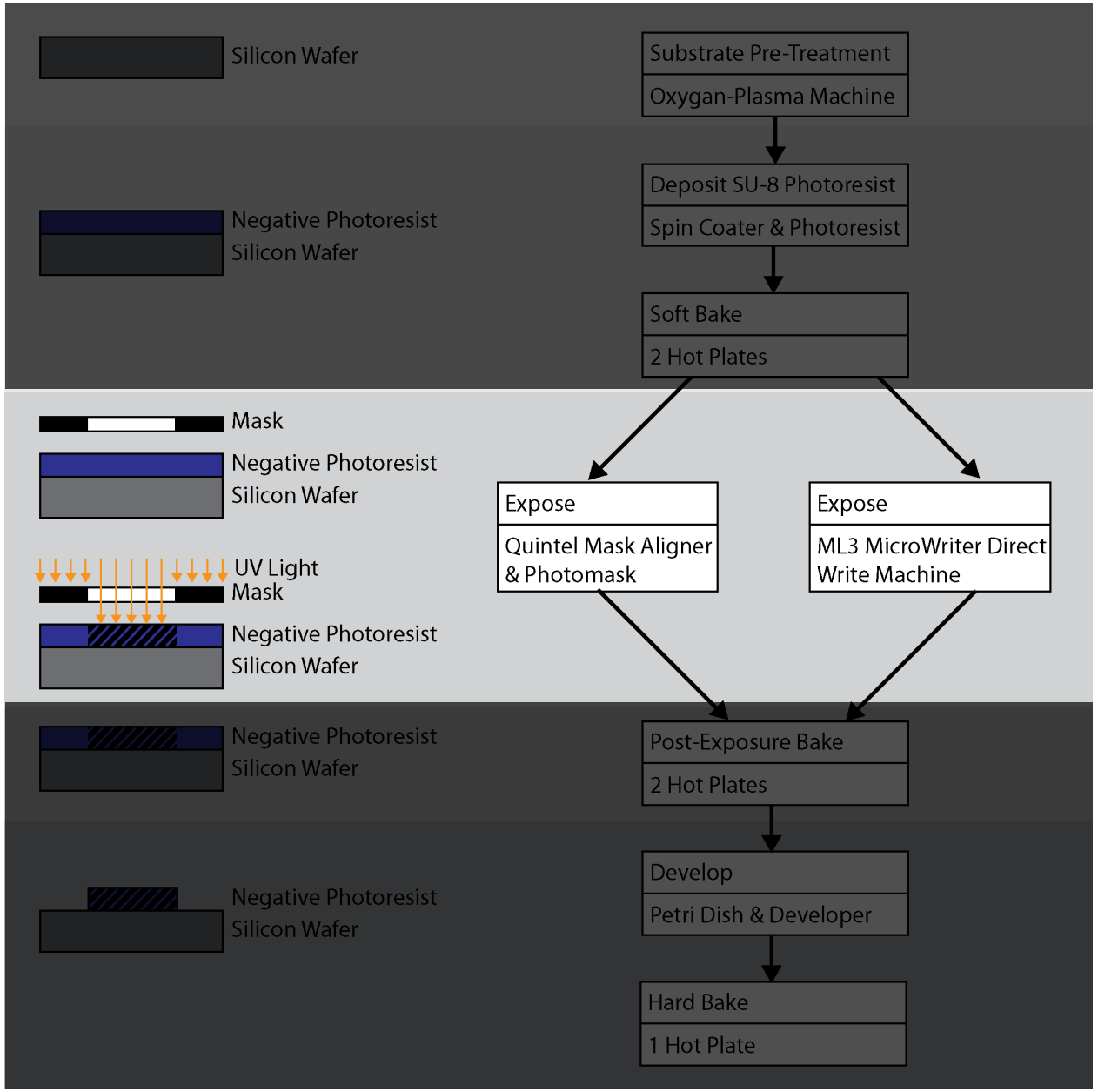
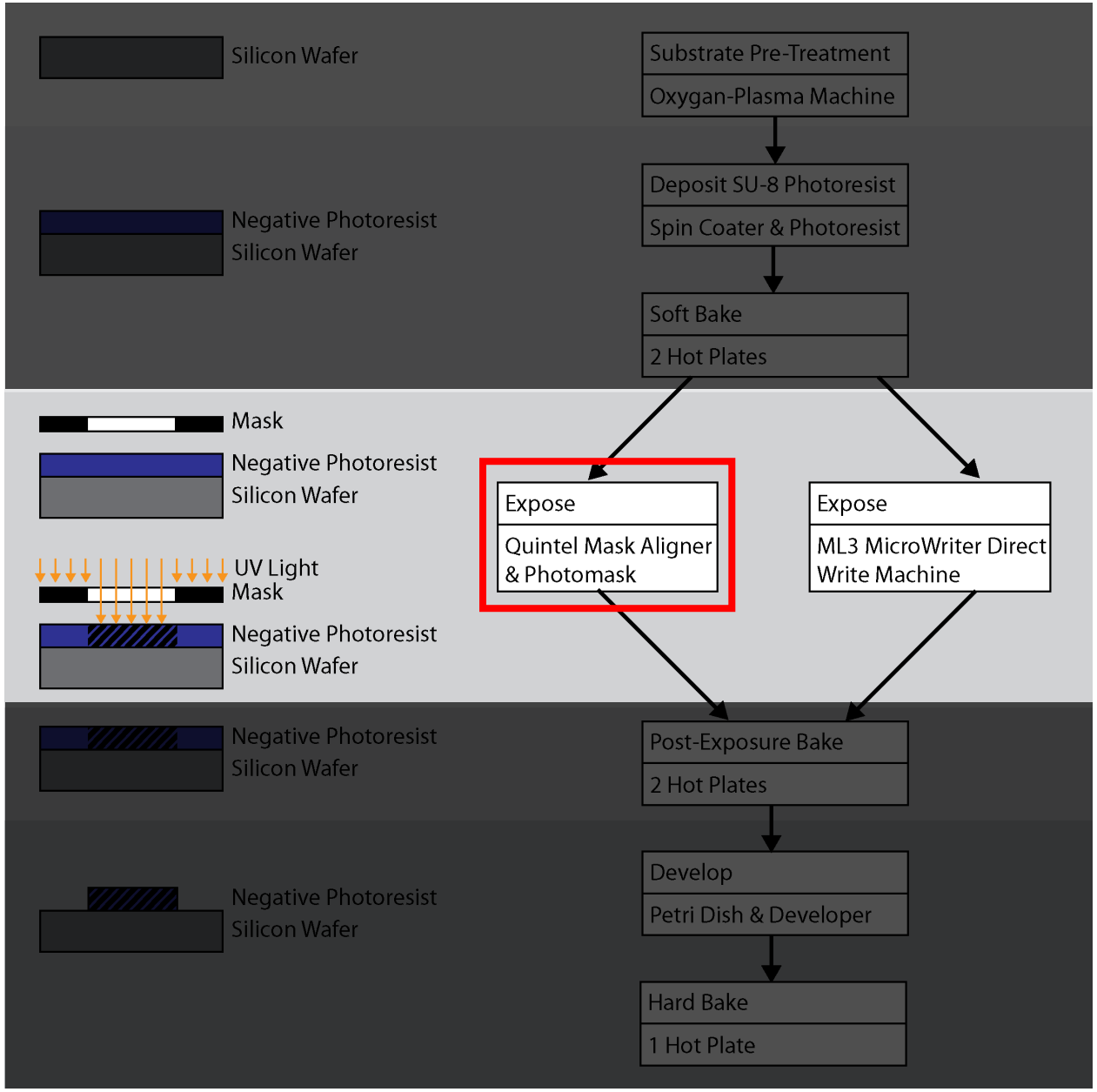


	Quintel	ML3
Pros	• Fast exposure time • Quick repetitions of one device design	• Can design digital mask and write with it in the same day • Do not need to order shadow mask
Cons	• Need to make shadow mask (Tang Lab orders masks from CAD/ART services, https://www.outputcity.com/)	• Very slow to write due to 385nm UV source. • Ghost lines at stitch locations due to optical interference at interfaces of write-fields. • Channel designs must be converted to .cif format using Clewin software
Other notes	• Tang lab uses Quintel to make most devices due to less time and money to make a full wafer of designs	• Tang lab uses ML3 to prototype a single device design.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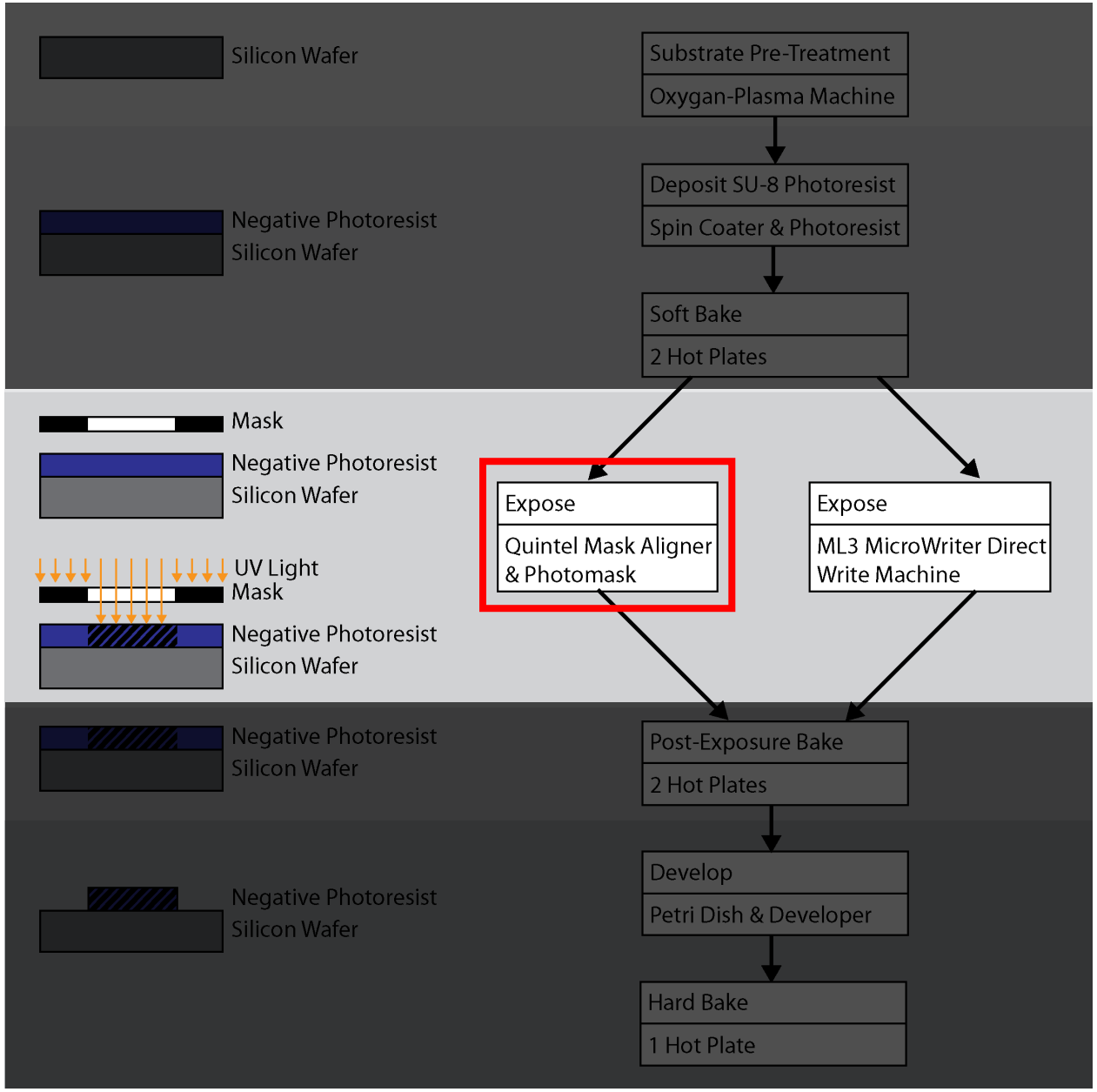
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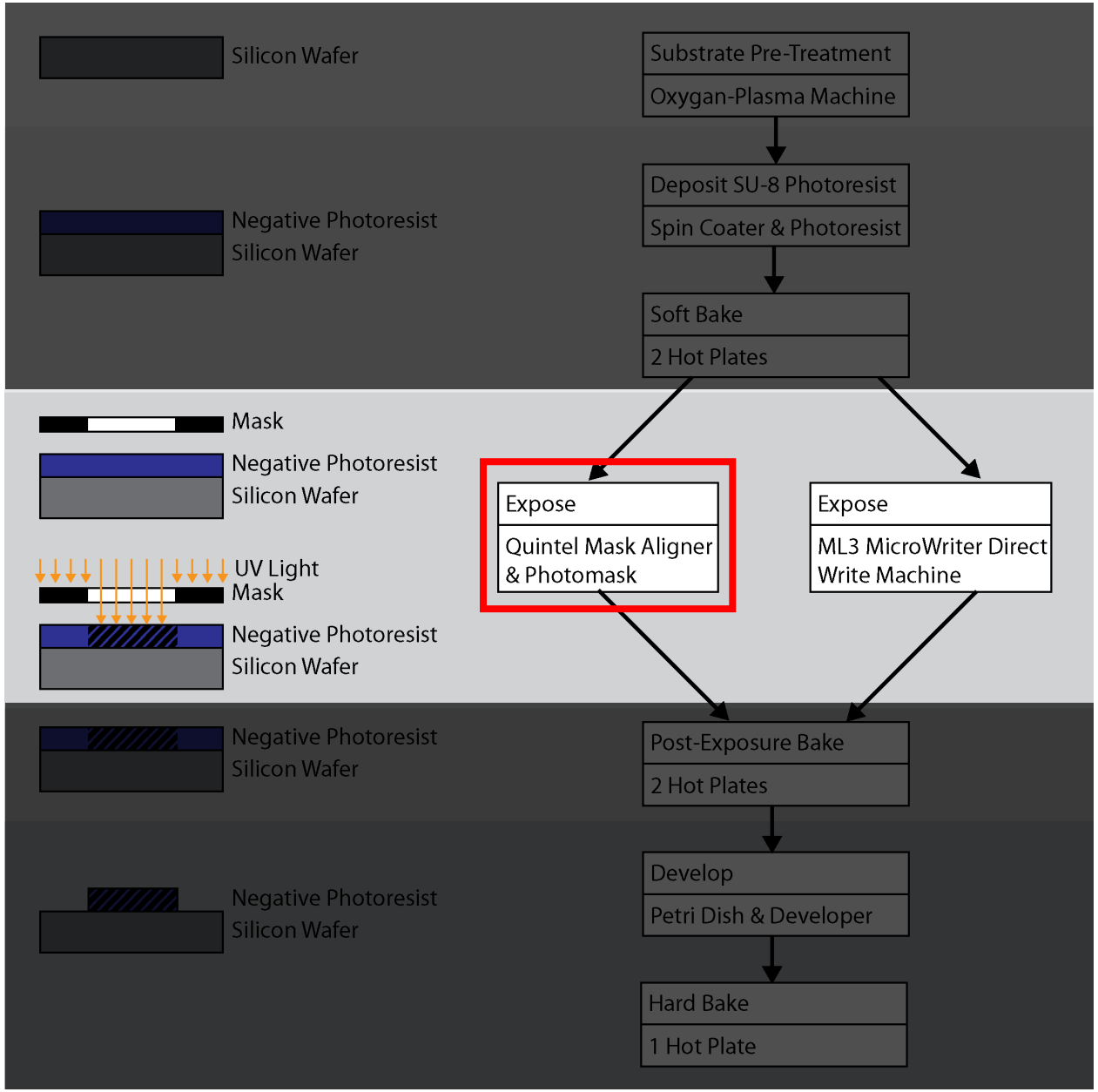
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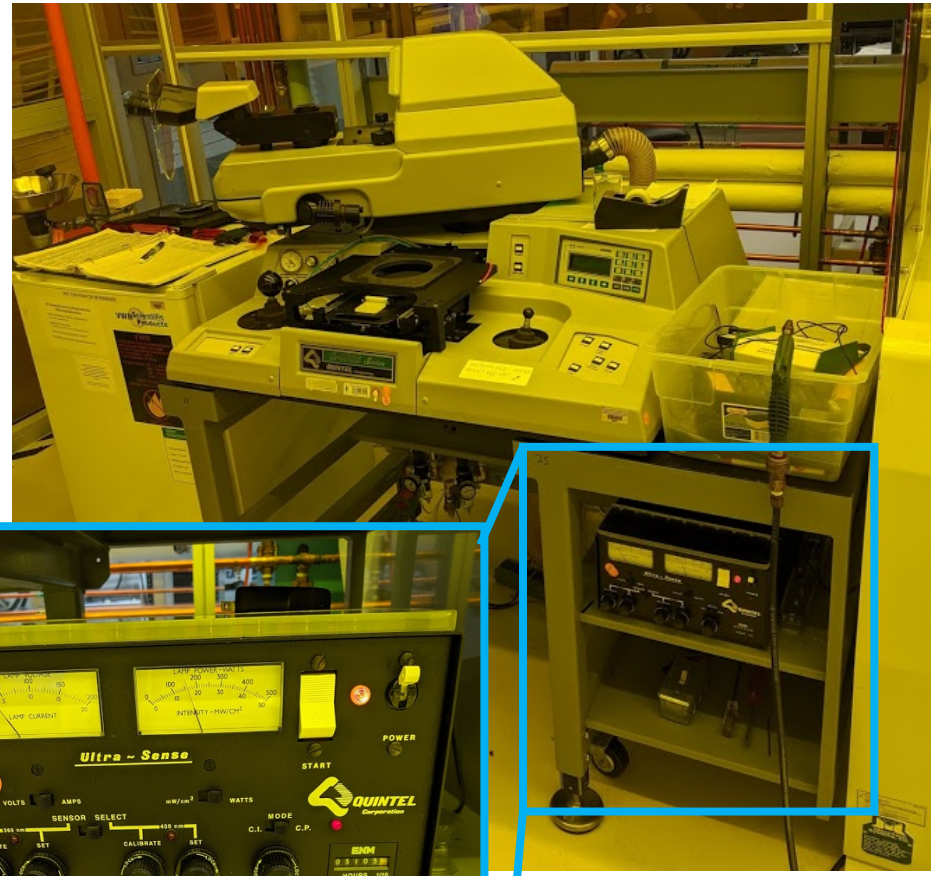
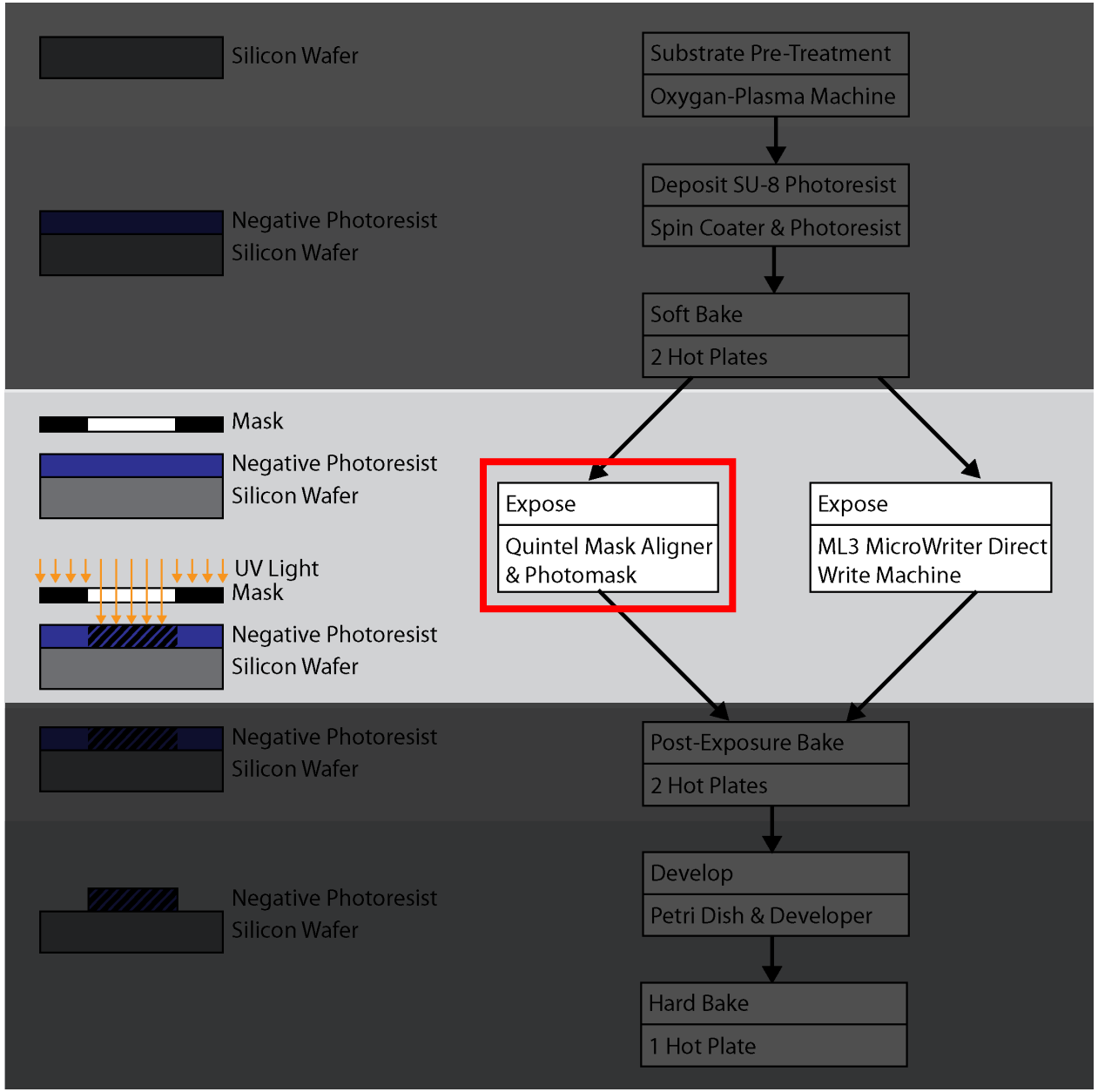



Ultra ~ Sense
QUINTEL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Oxygan-Plasma Machine
Deposit SU-8 Photoresist
Spin Coater & Photoresist
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Soft Bake
2 Hot Plates
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Silicon Wafer
Expose
Quintel Mask Aligner & Photomask
Expose
ML3 MicroWriter Direct Write Machine
UV Light
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Negative Photoresist
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Post-Exposure Bake
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Develop
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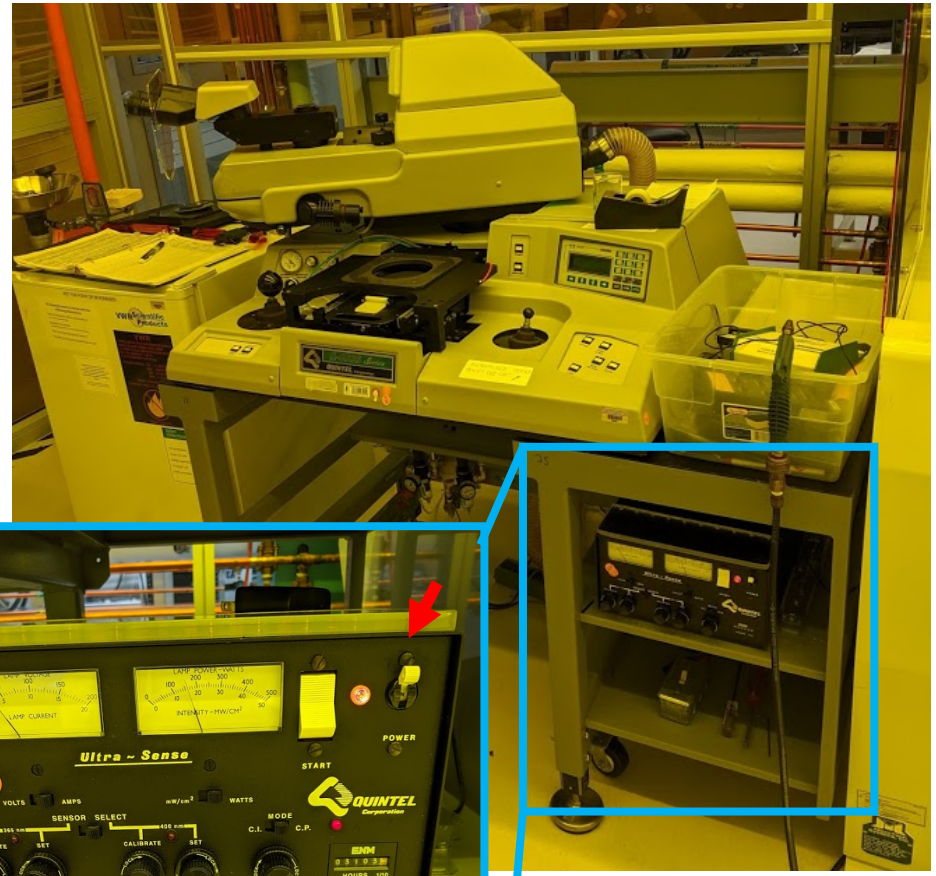
Hard Bake
1 Hot Plate

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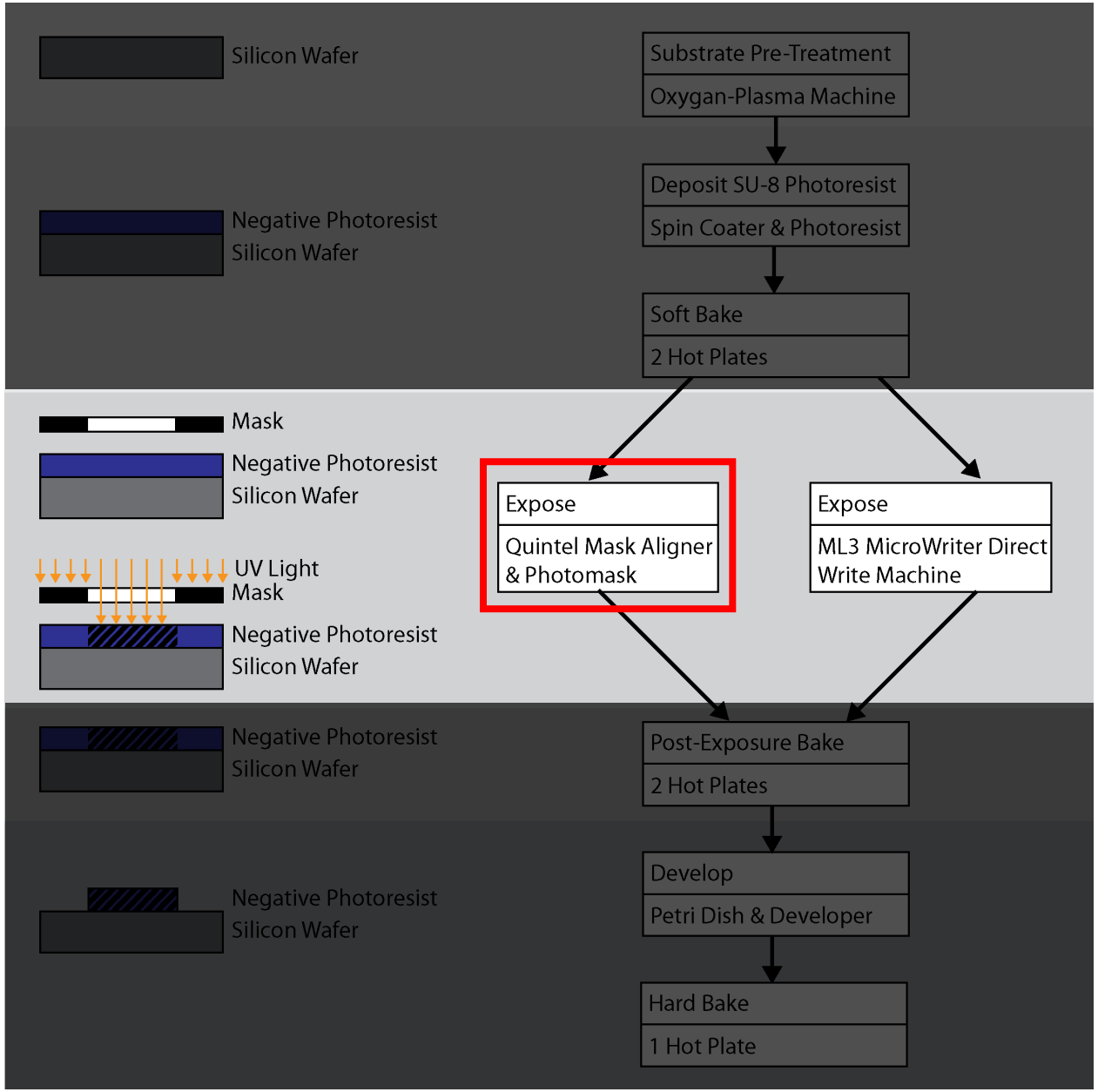
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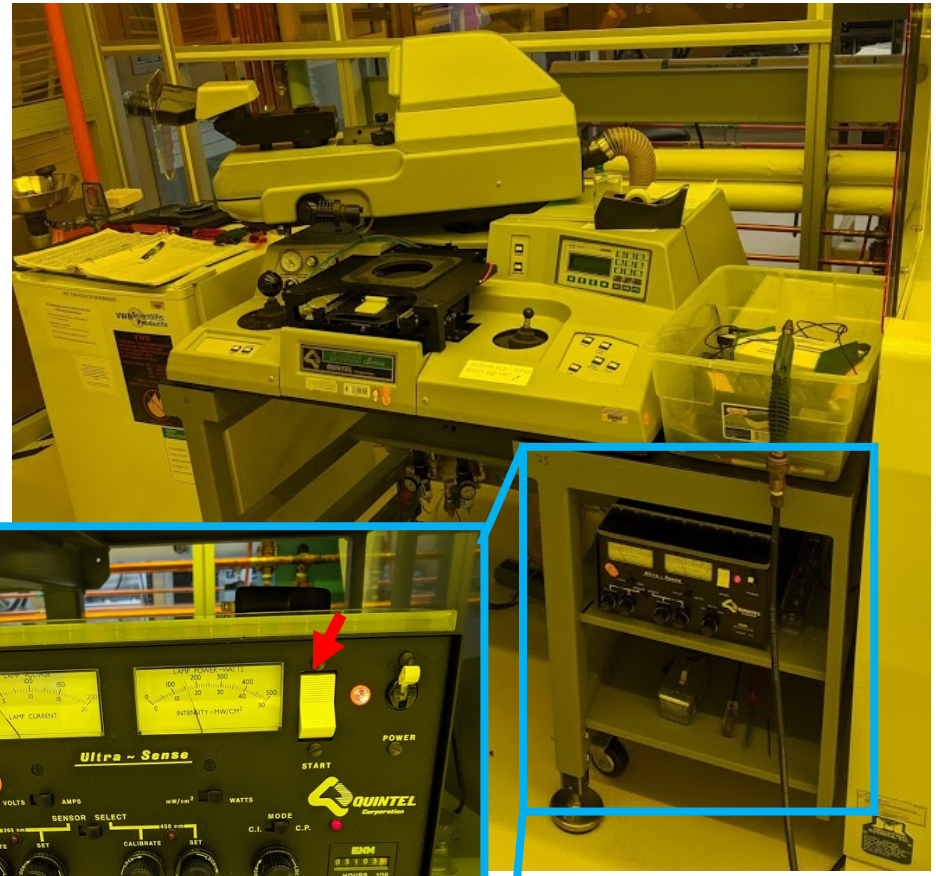


Ultra ~ Sense
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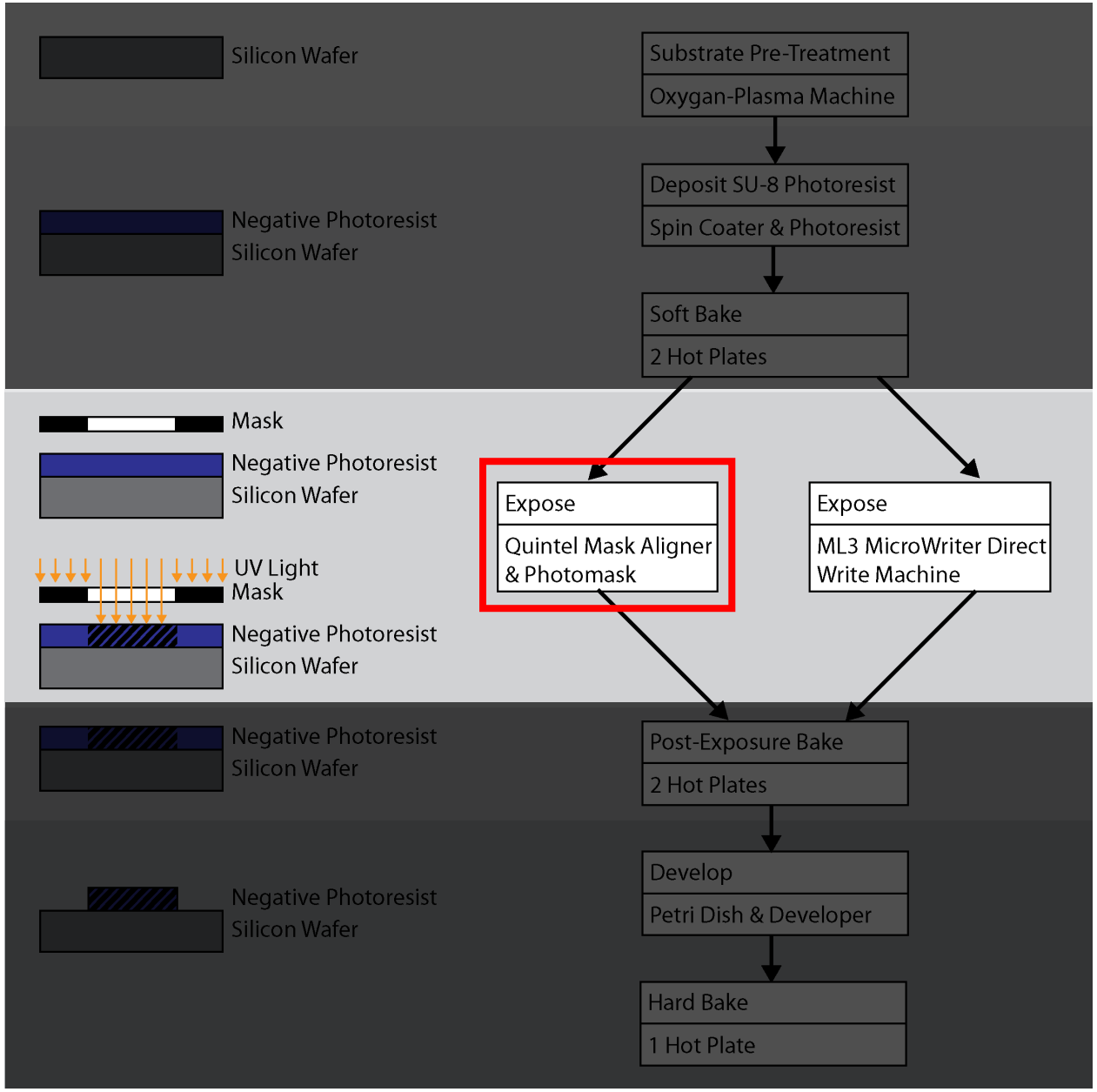
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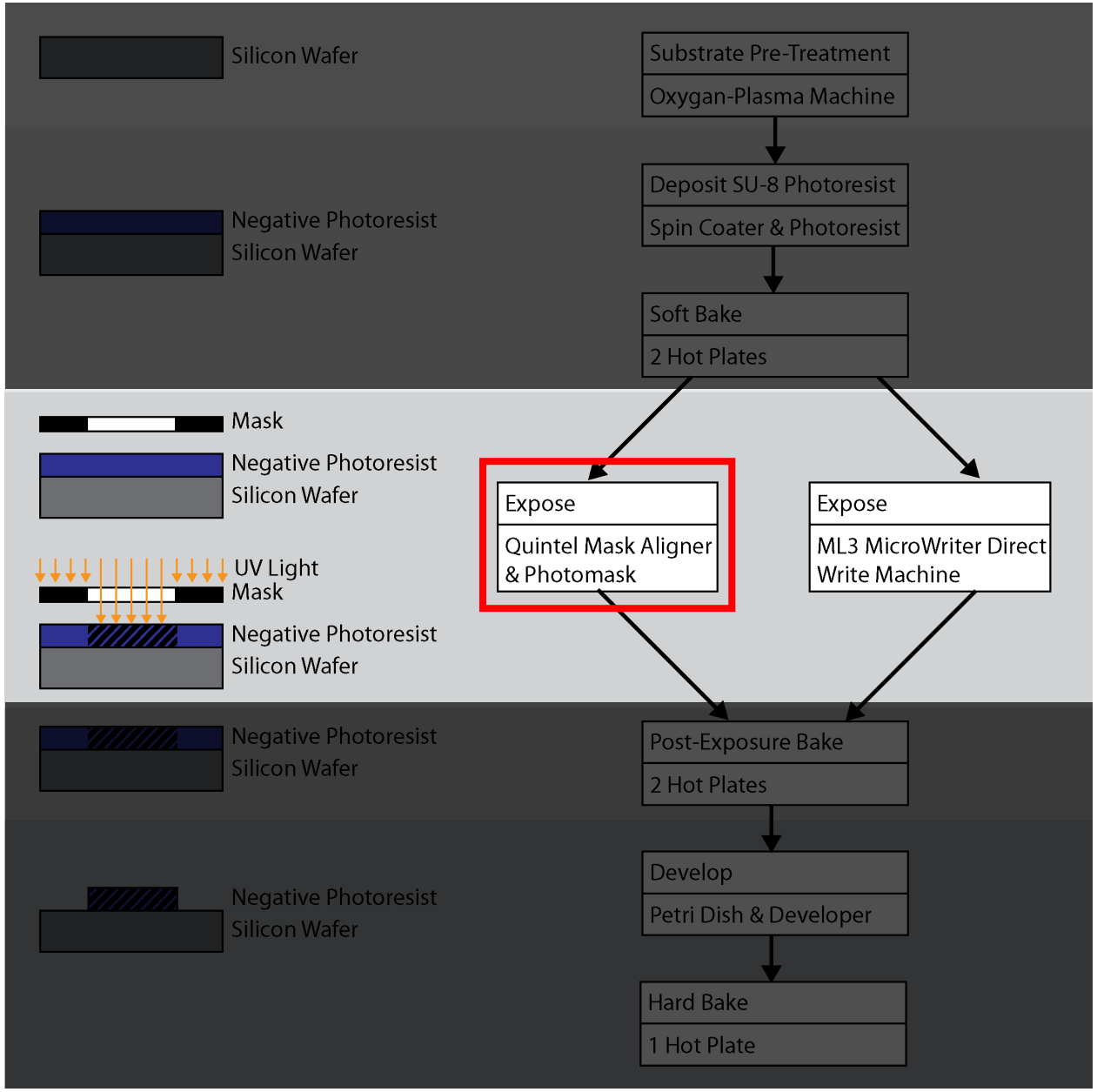
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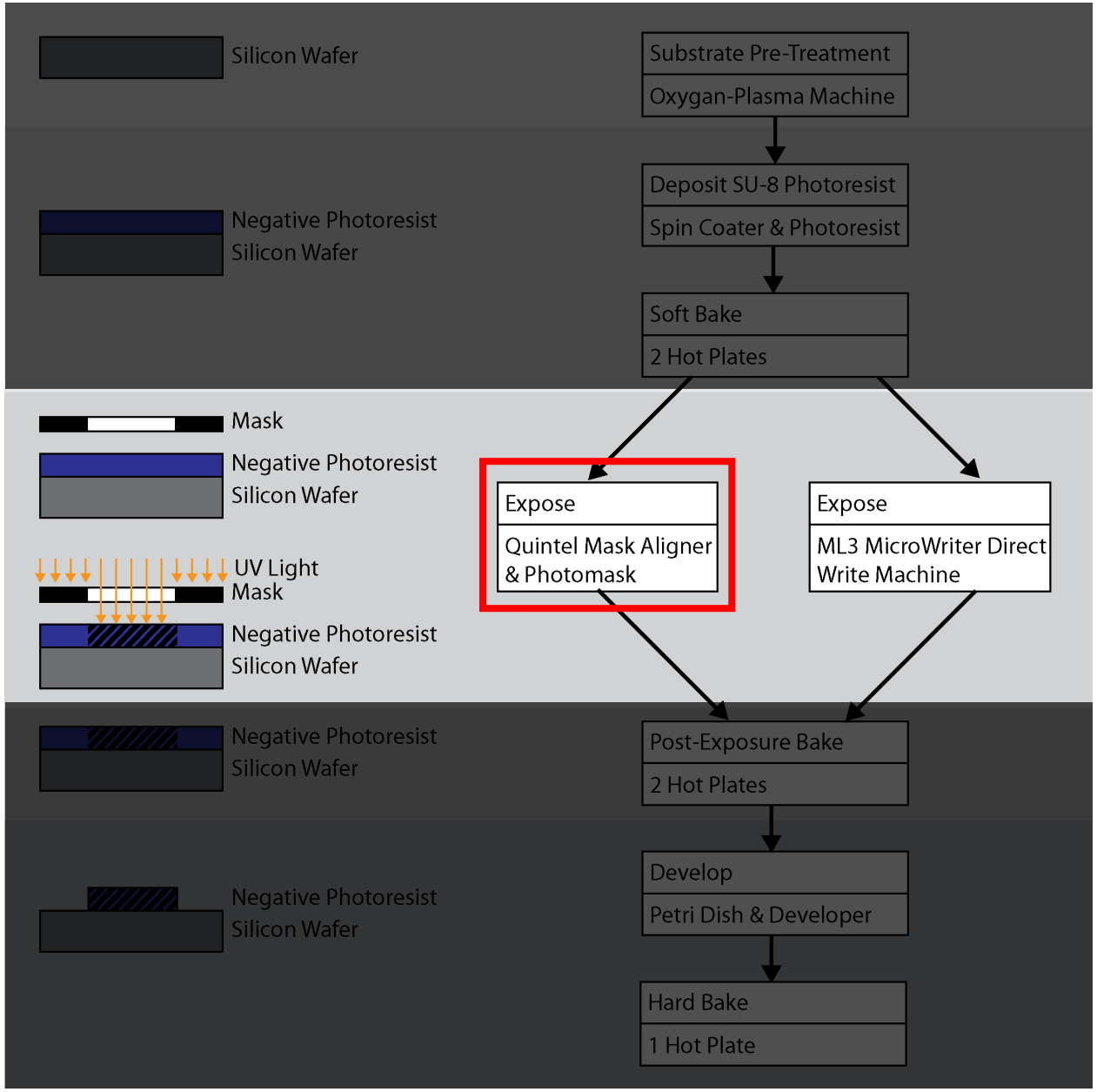
Q-4000 Series
QUINTEL Corporation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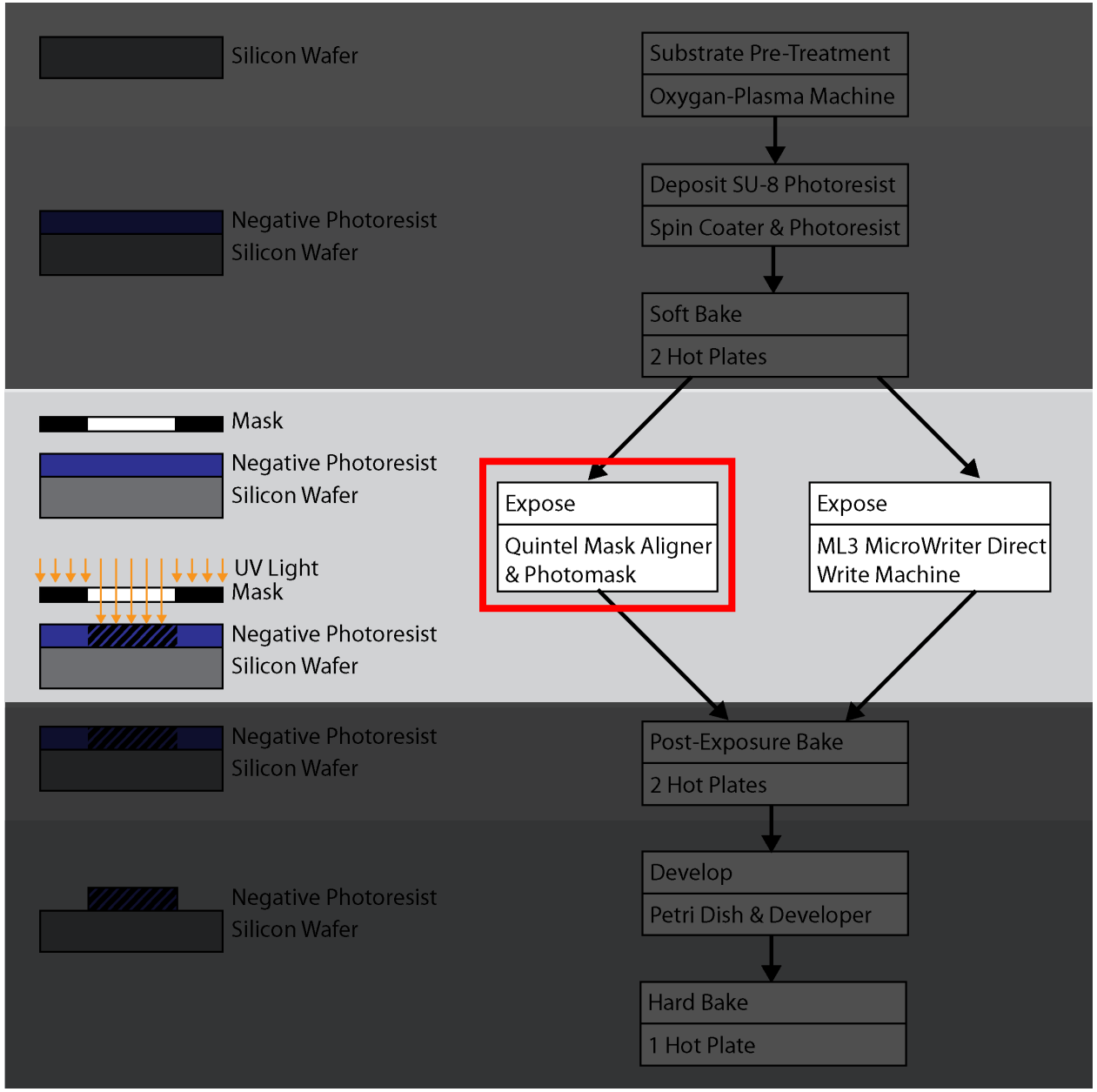
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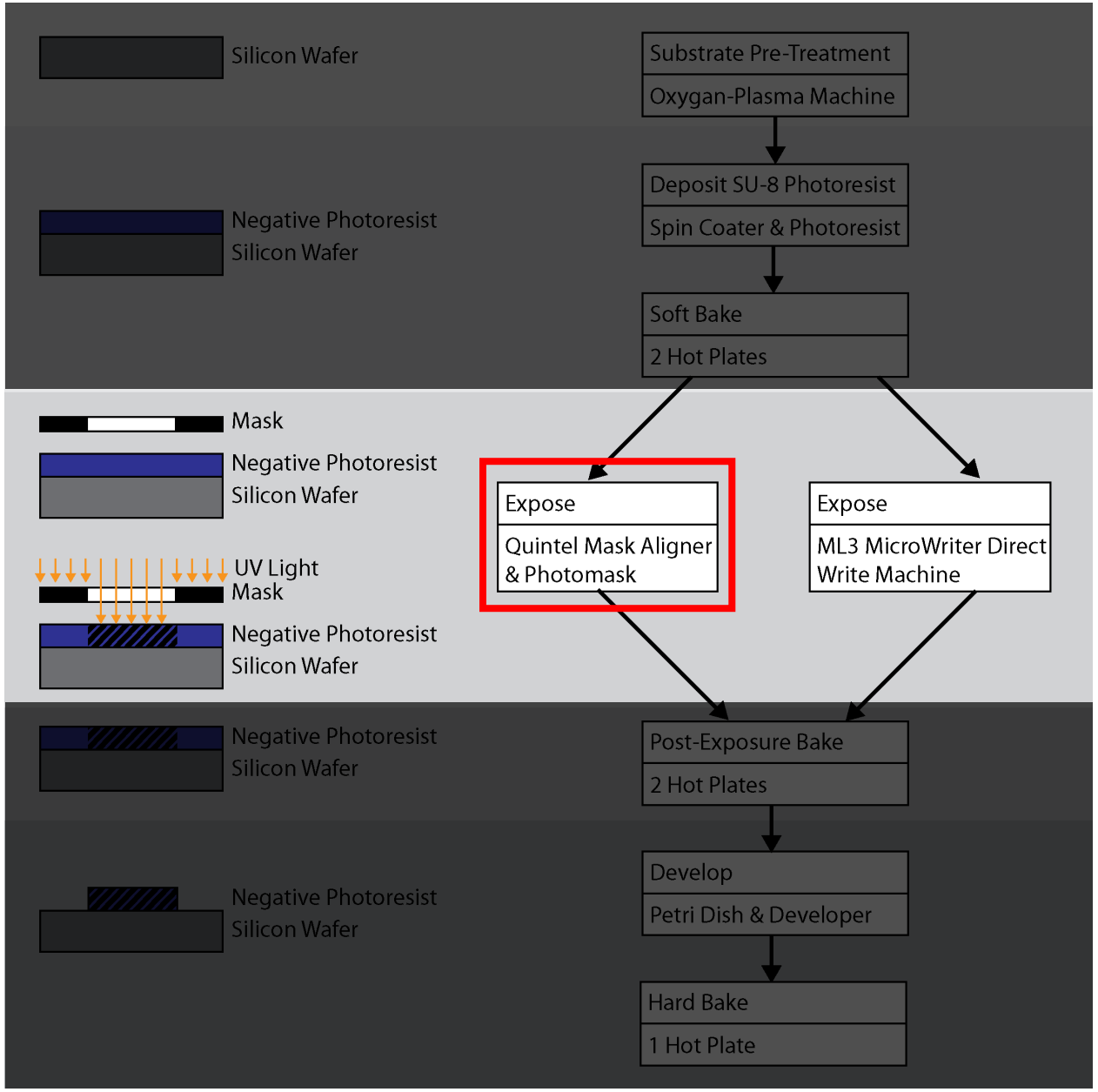
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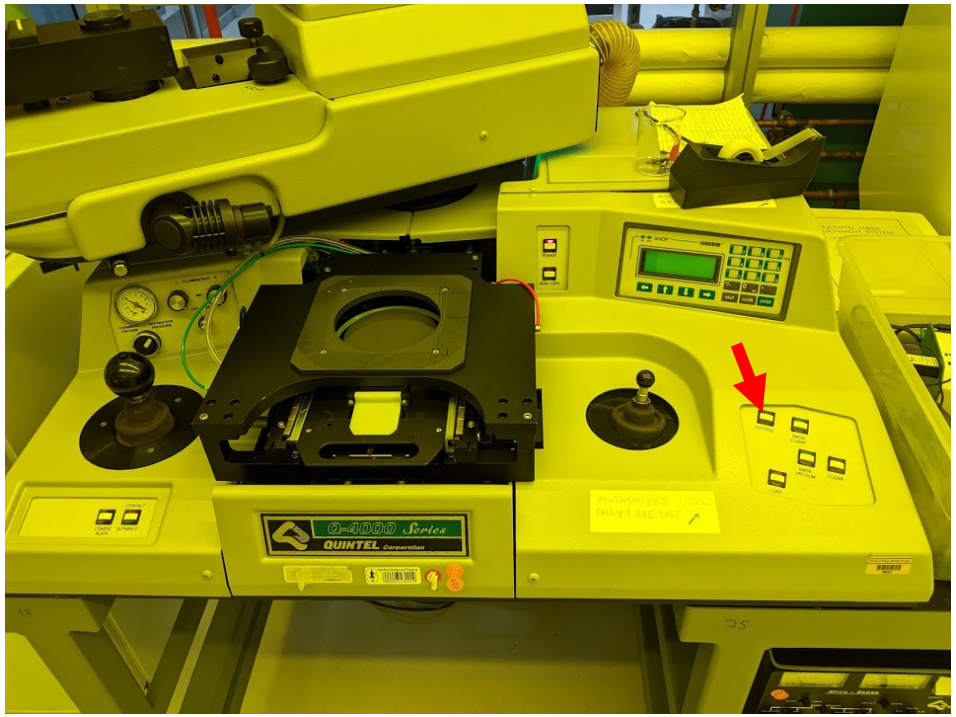
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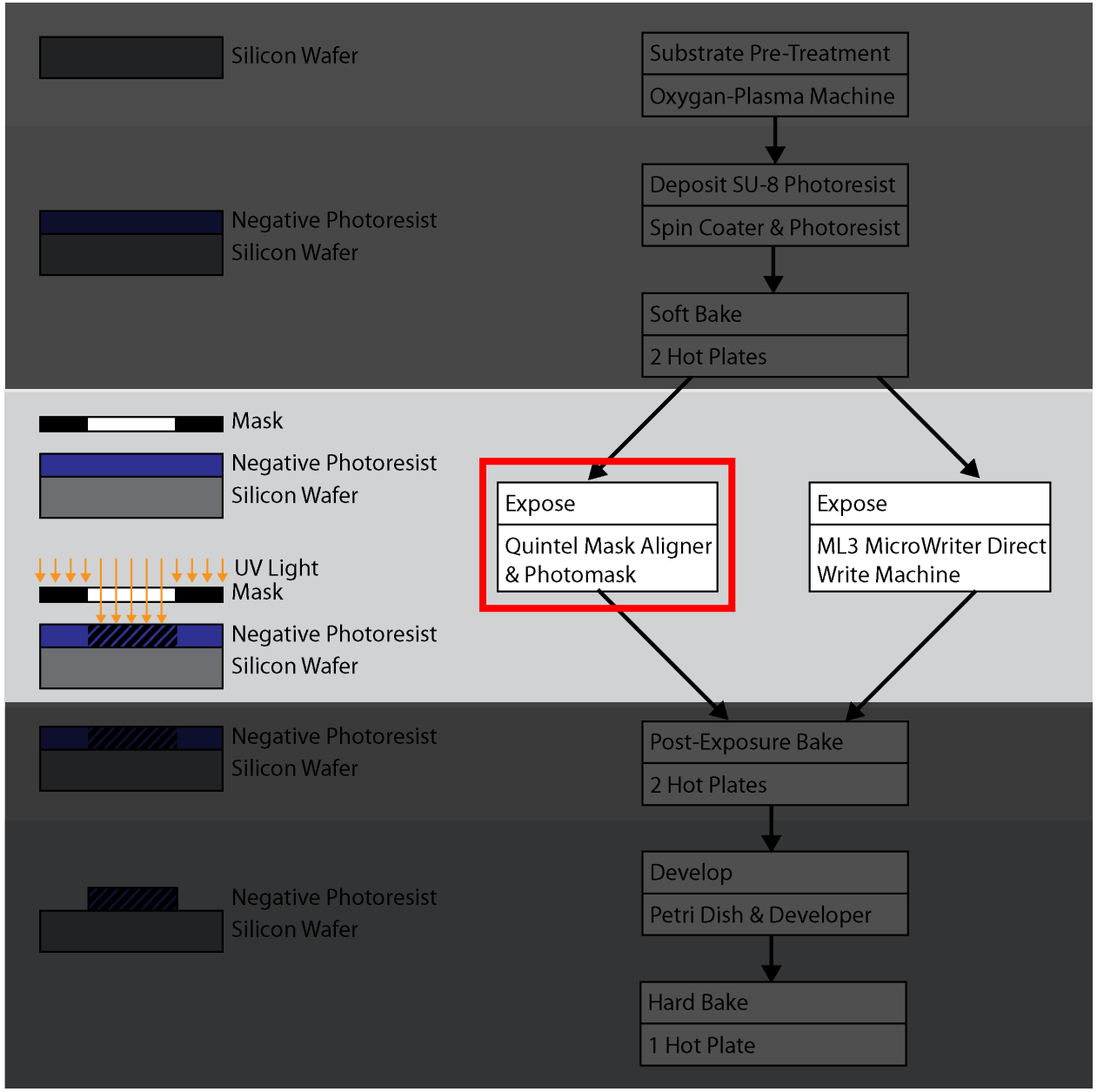
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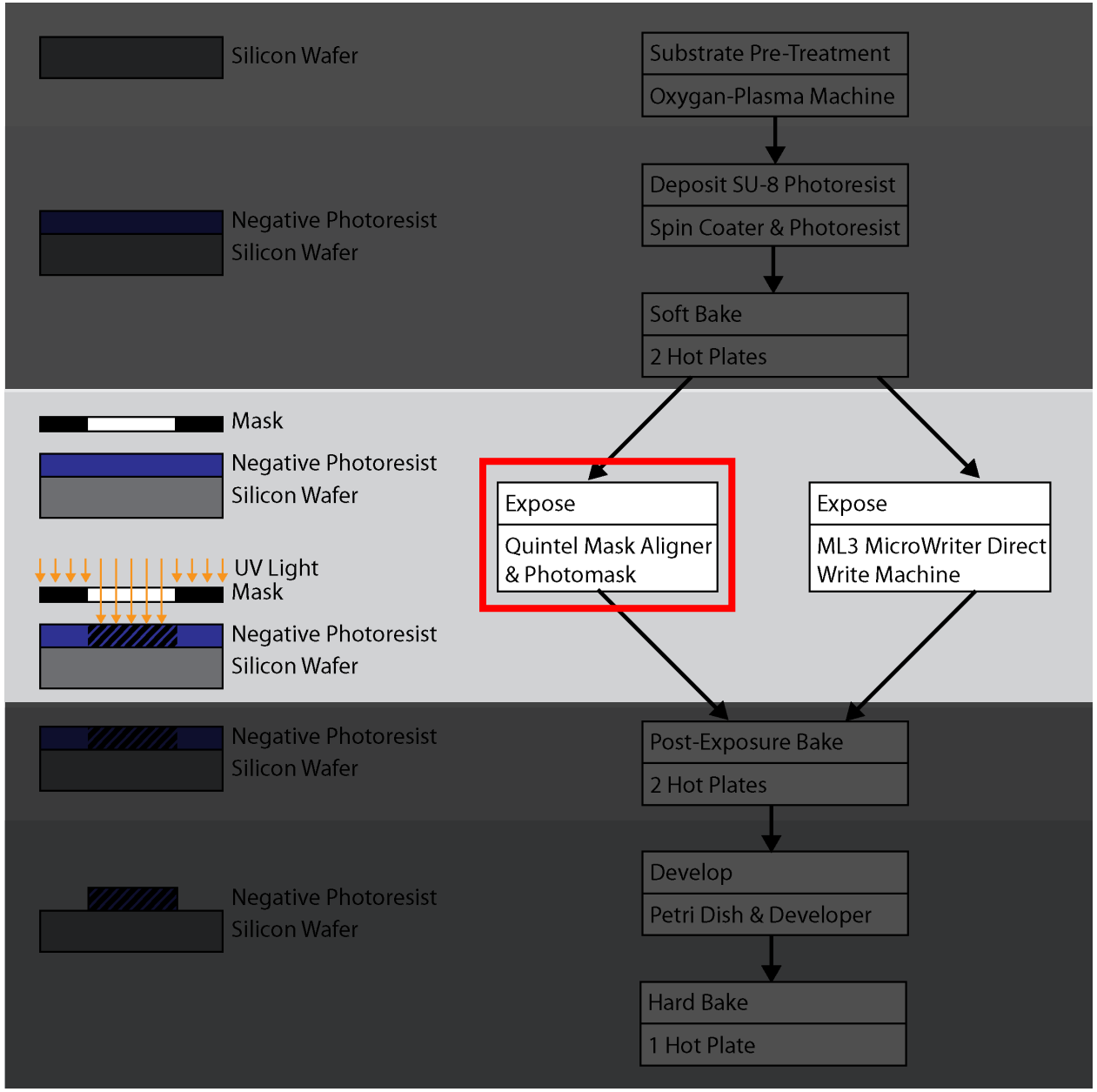
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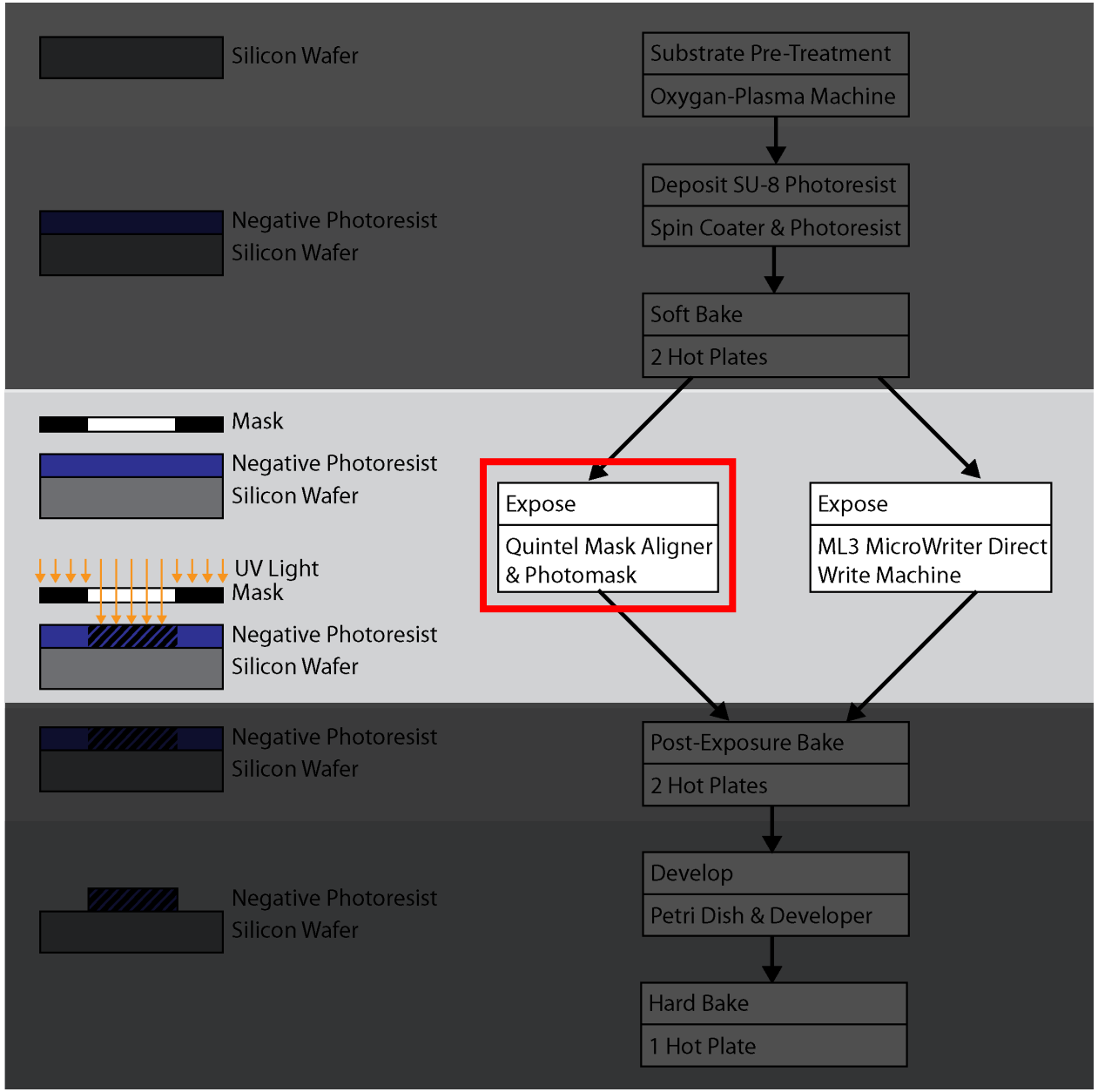
UniOP
DL FLT
Q4000 Tray Loader
Quintel Corporation
San Jose, CA USA
(press Enter)
HELP
CLEAR
ENTER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EXPOSE
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MASK VACUUM
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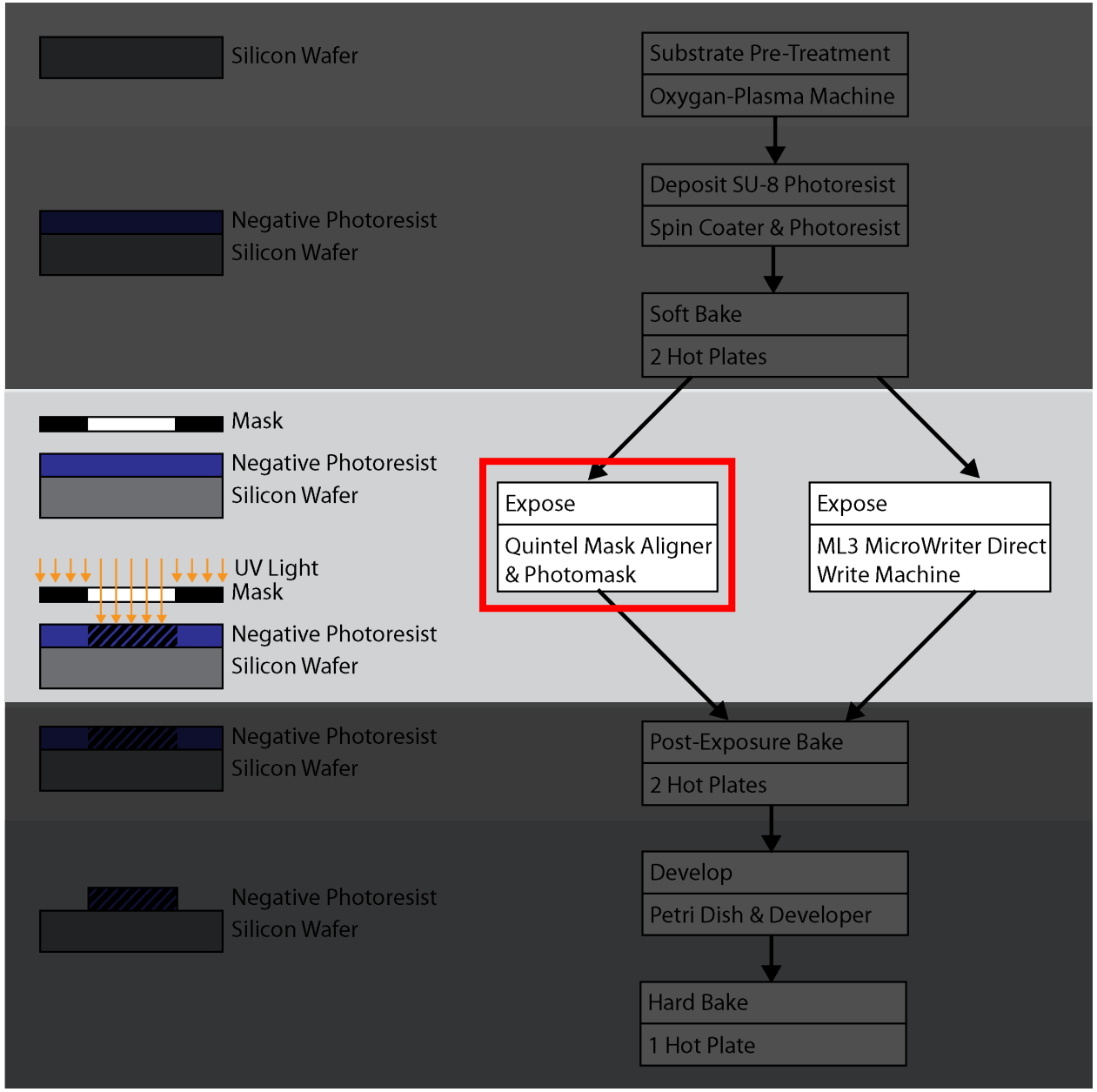
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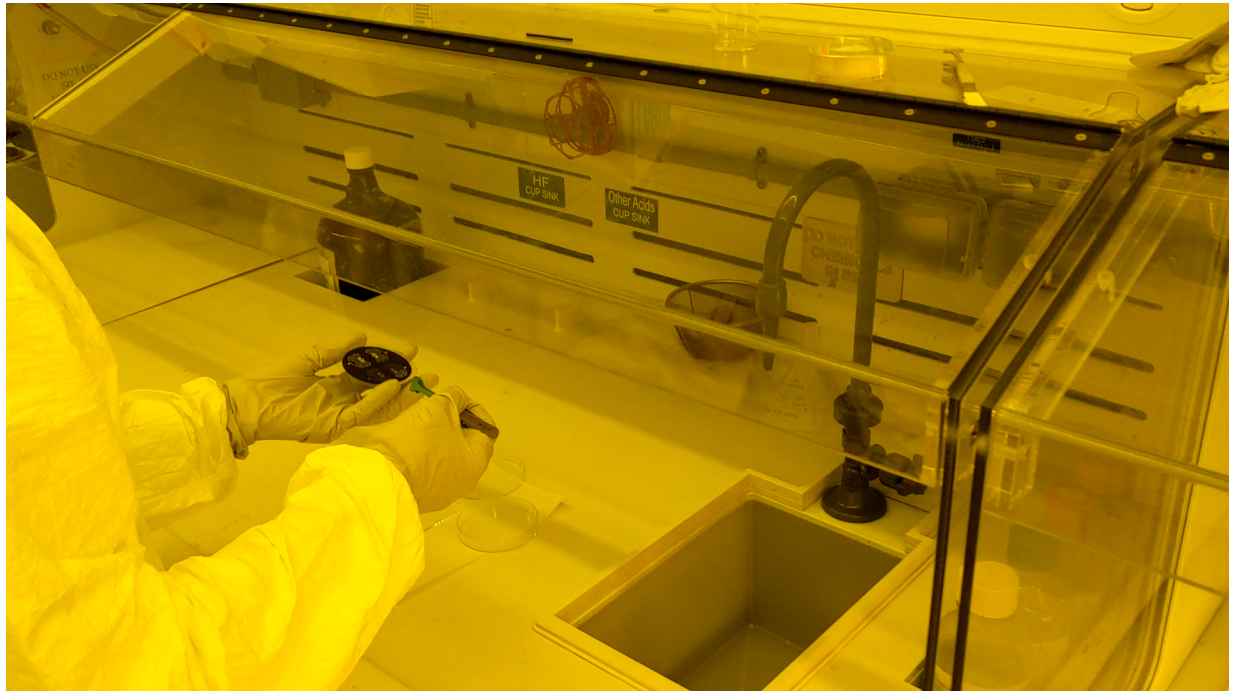
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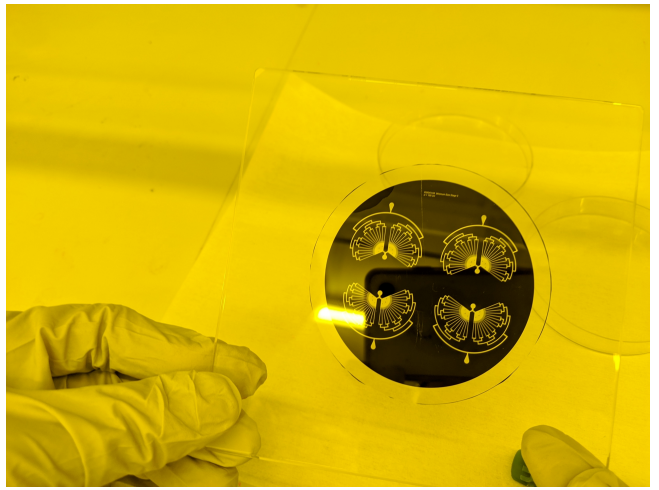

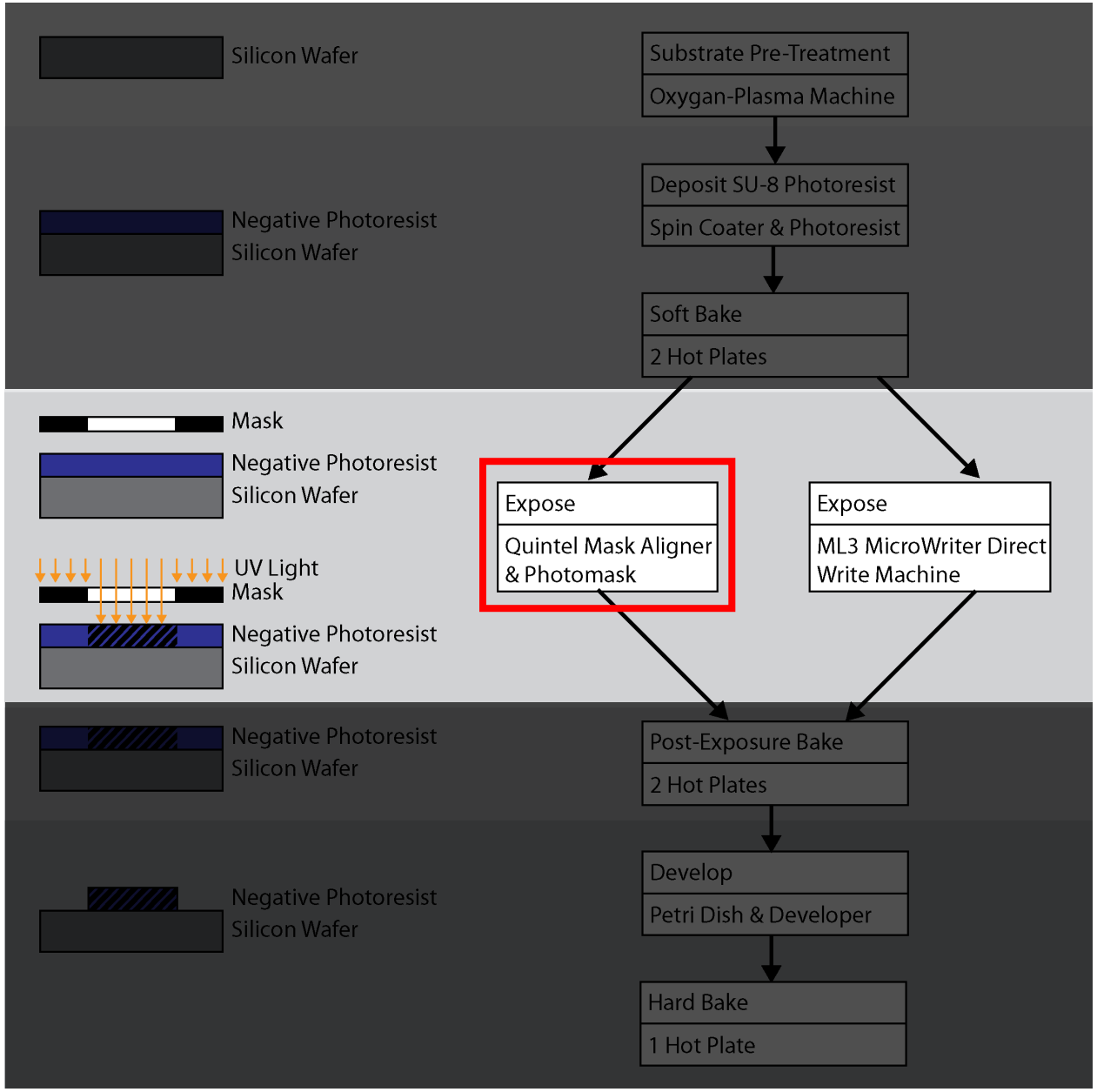
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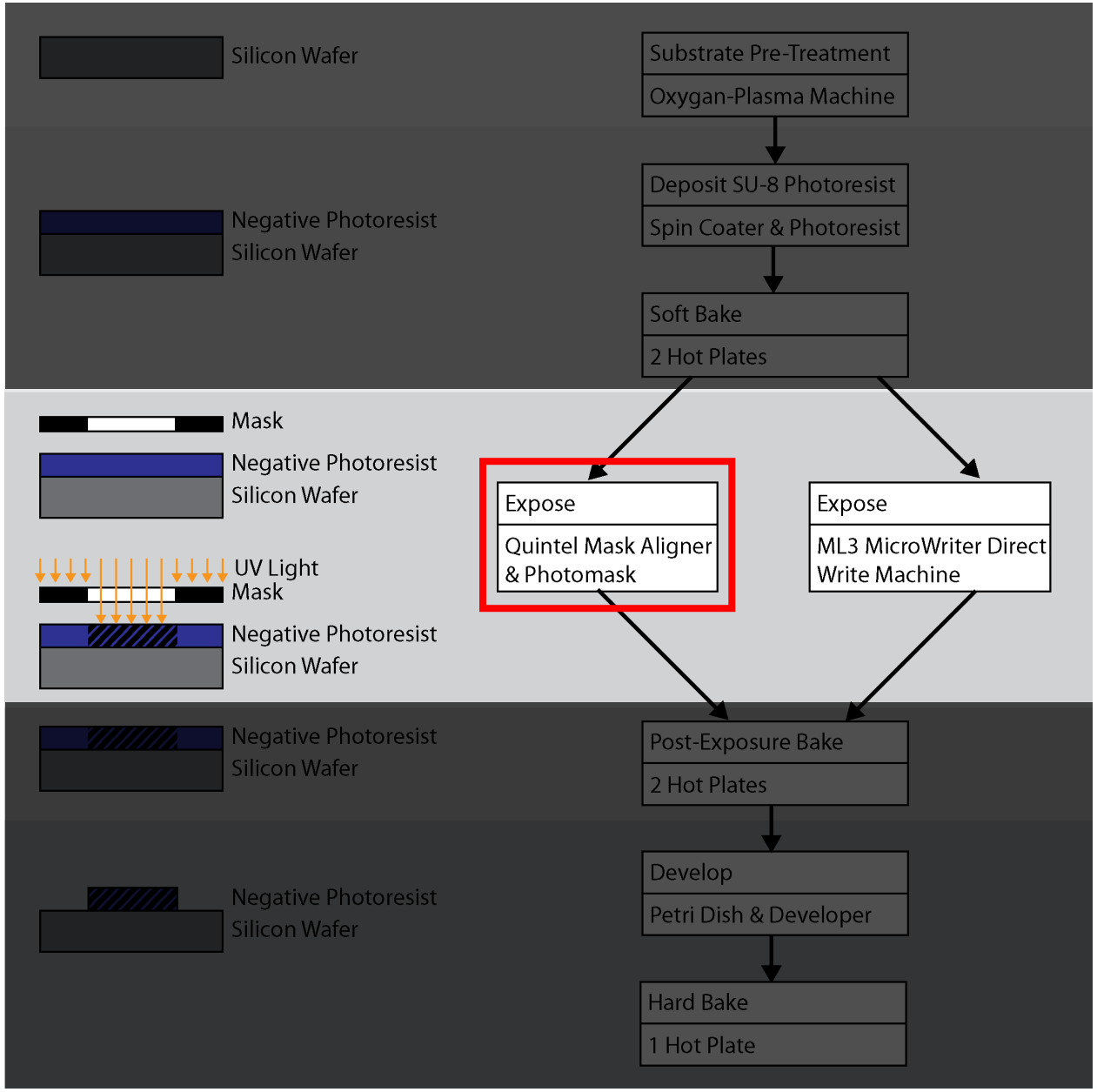
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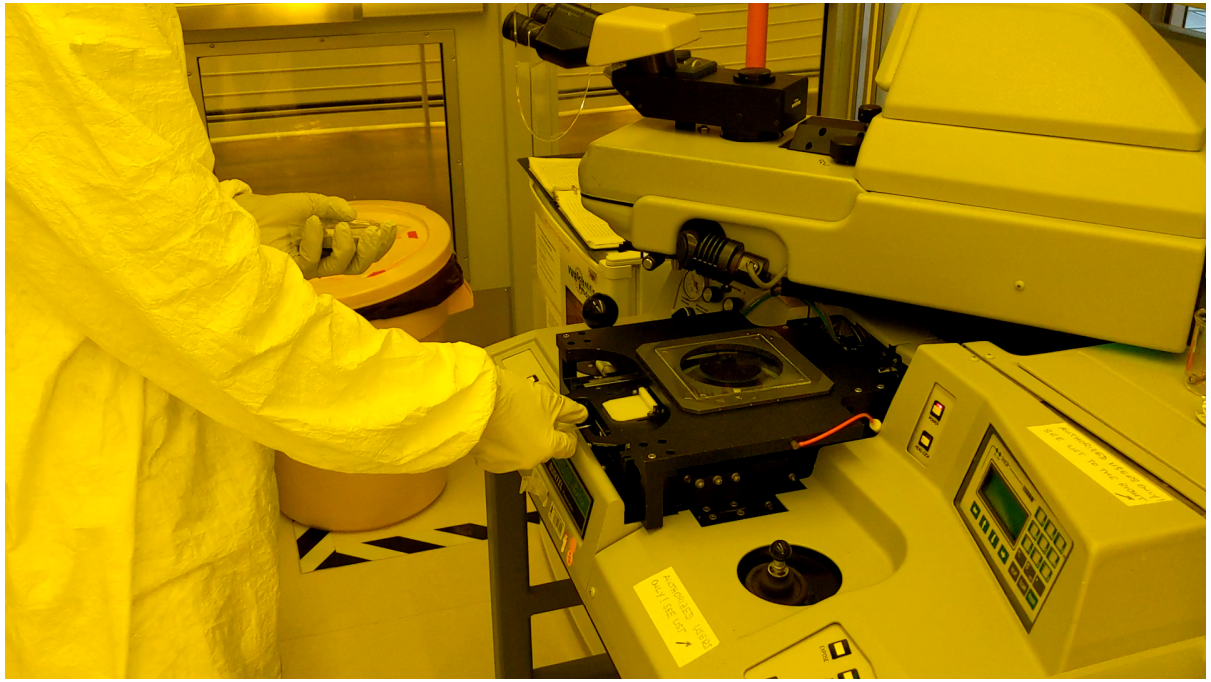

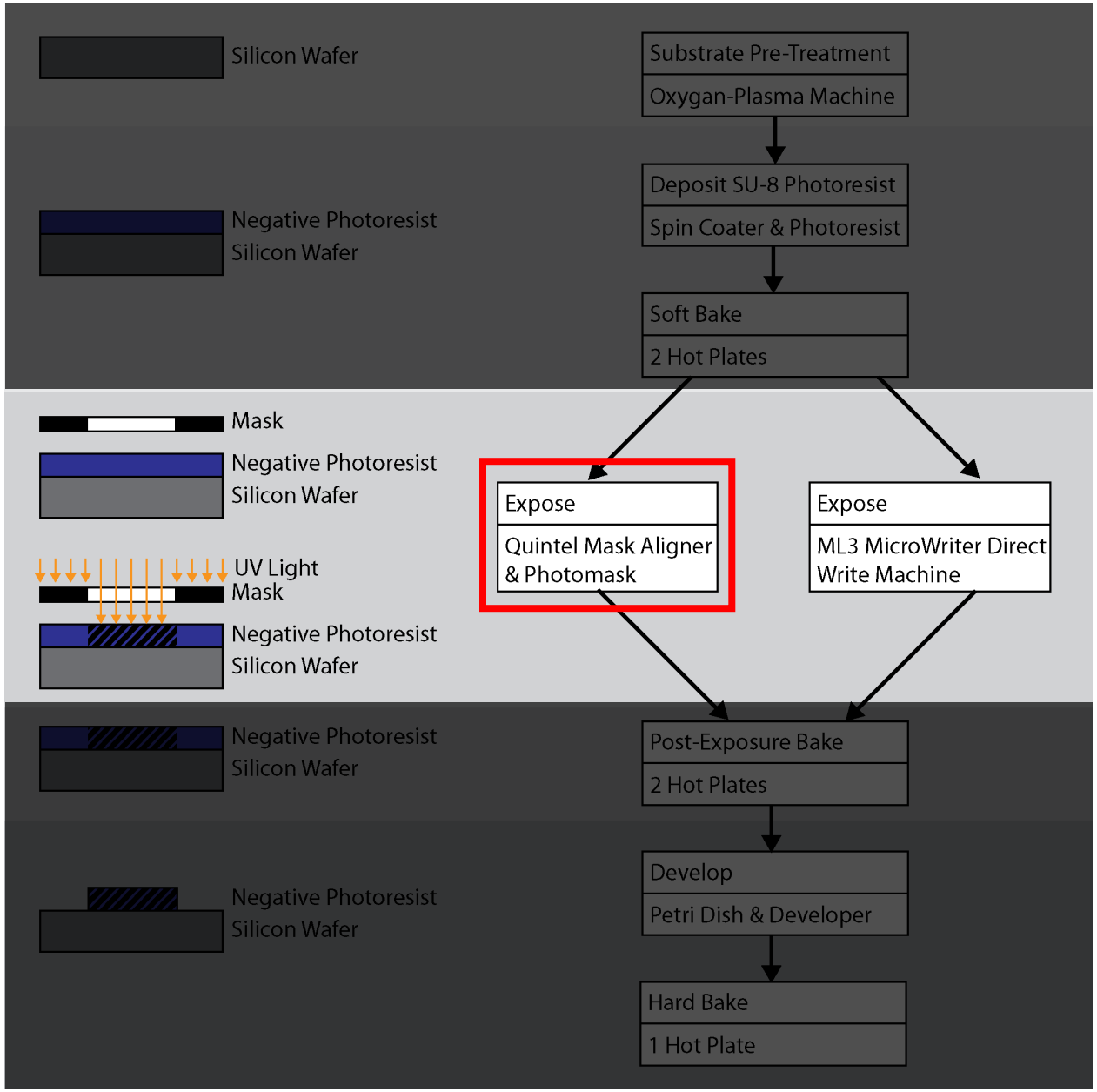
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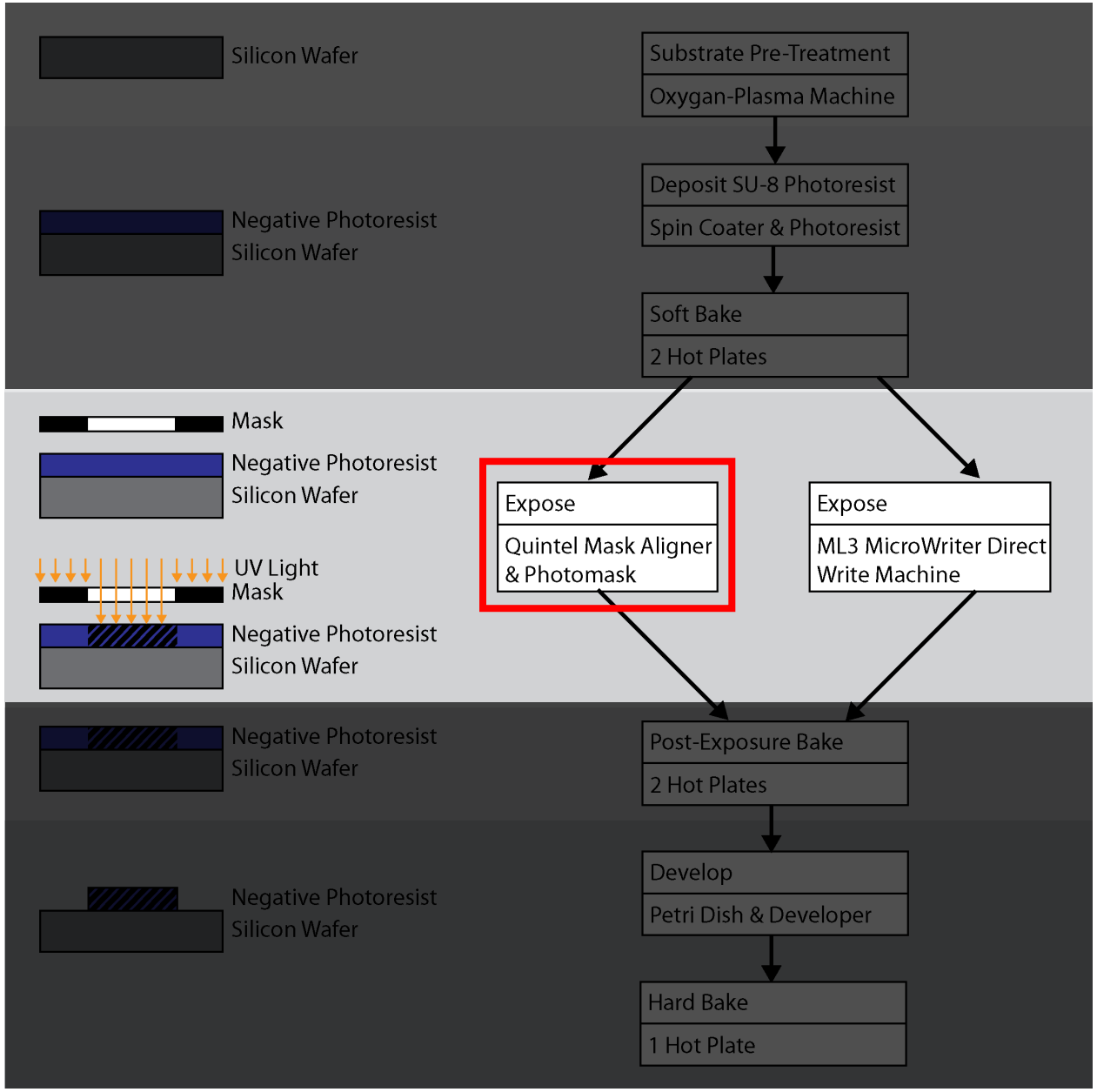
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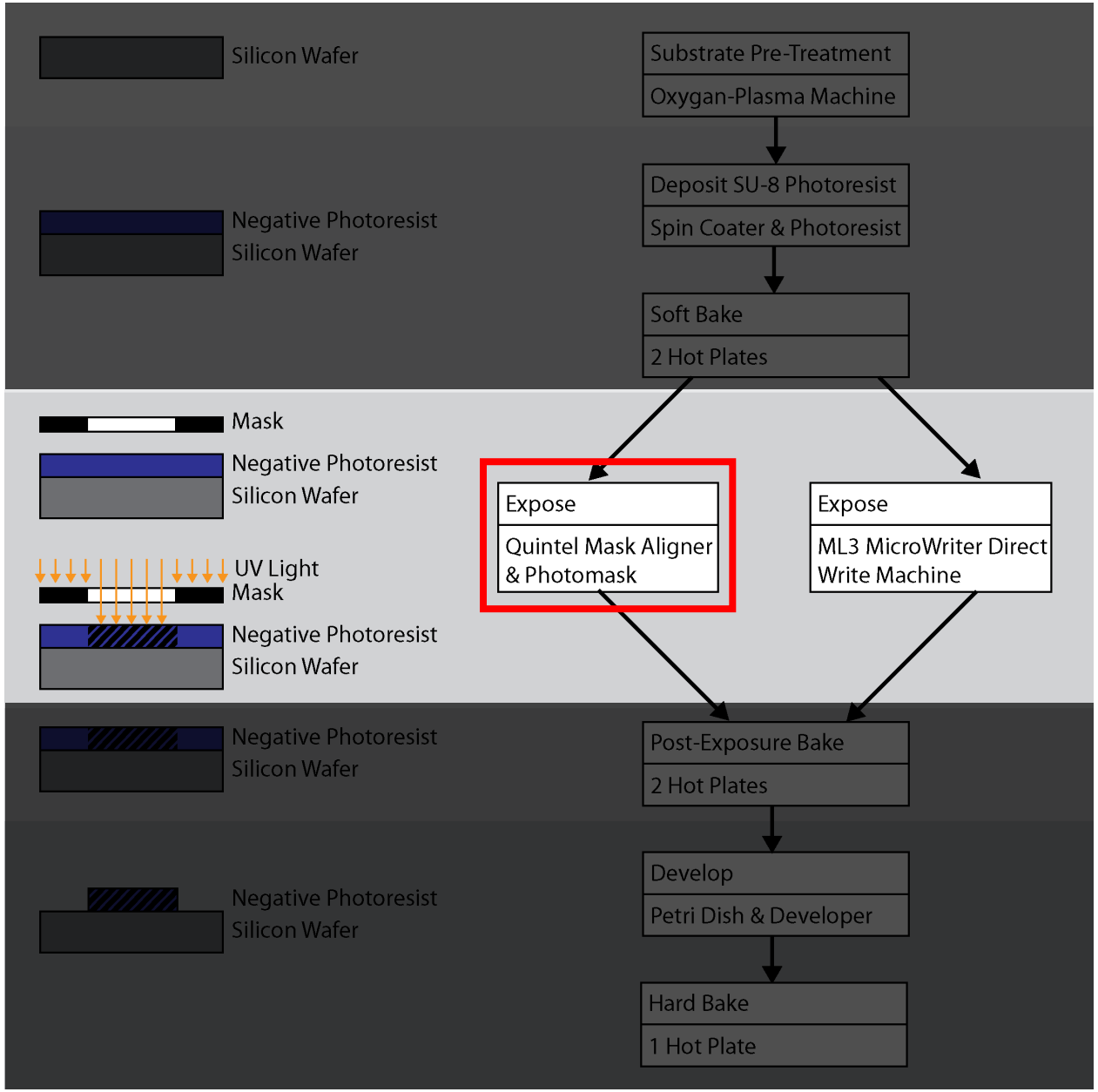
Q-4000 Series
QUINTEL Corporation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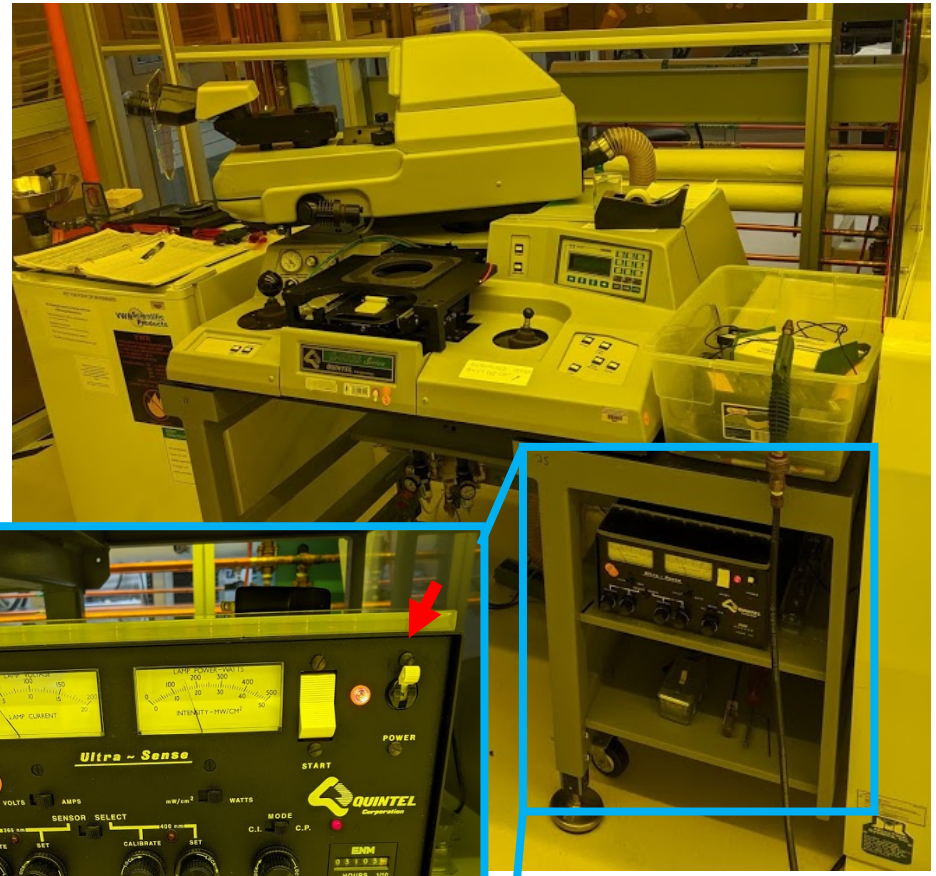


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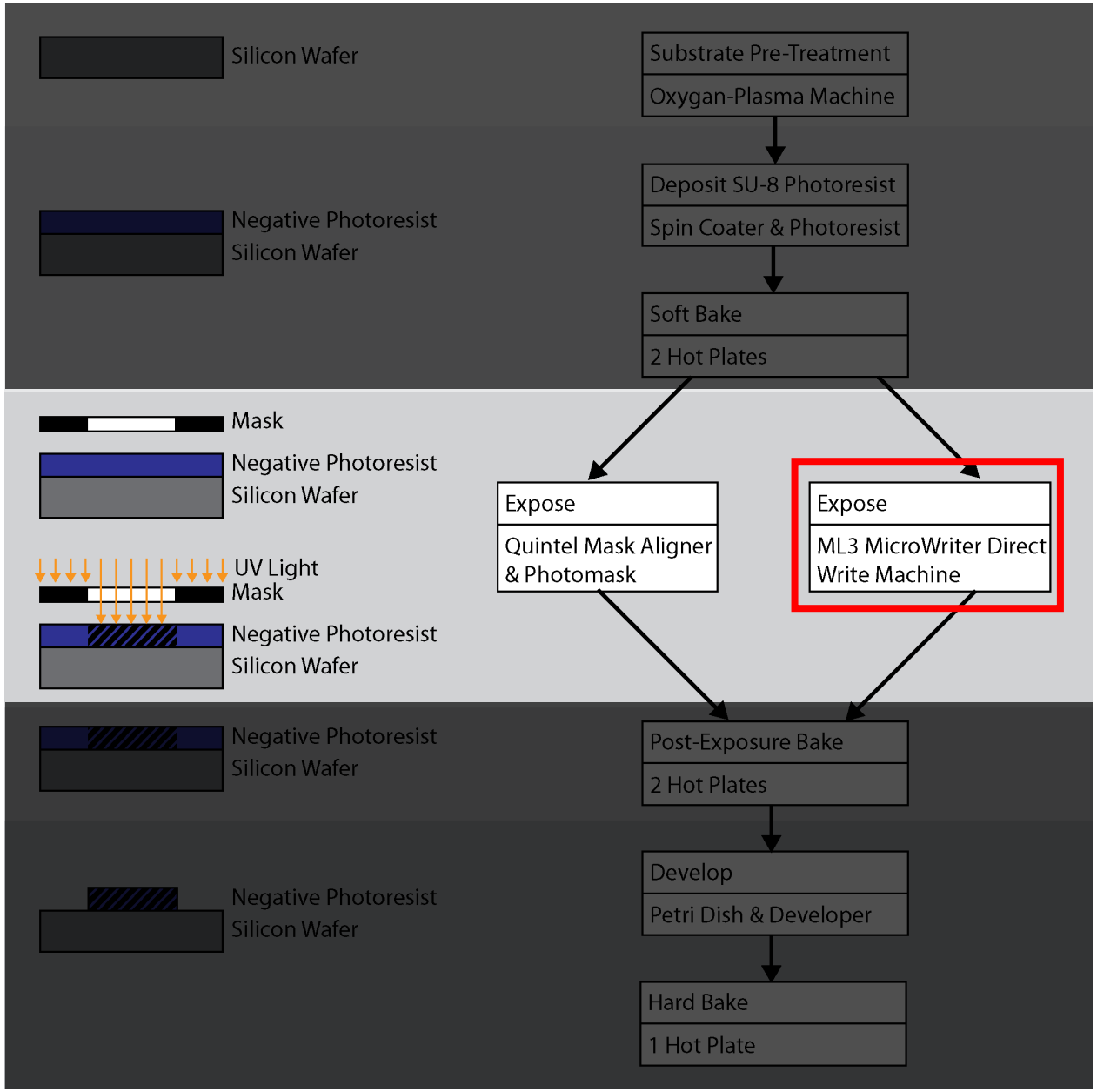
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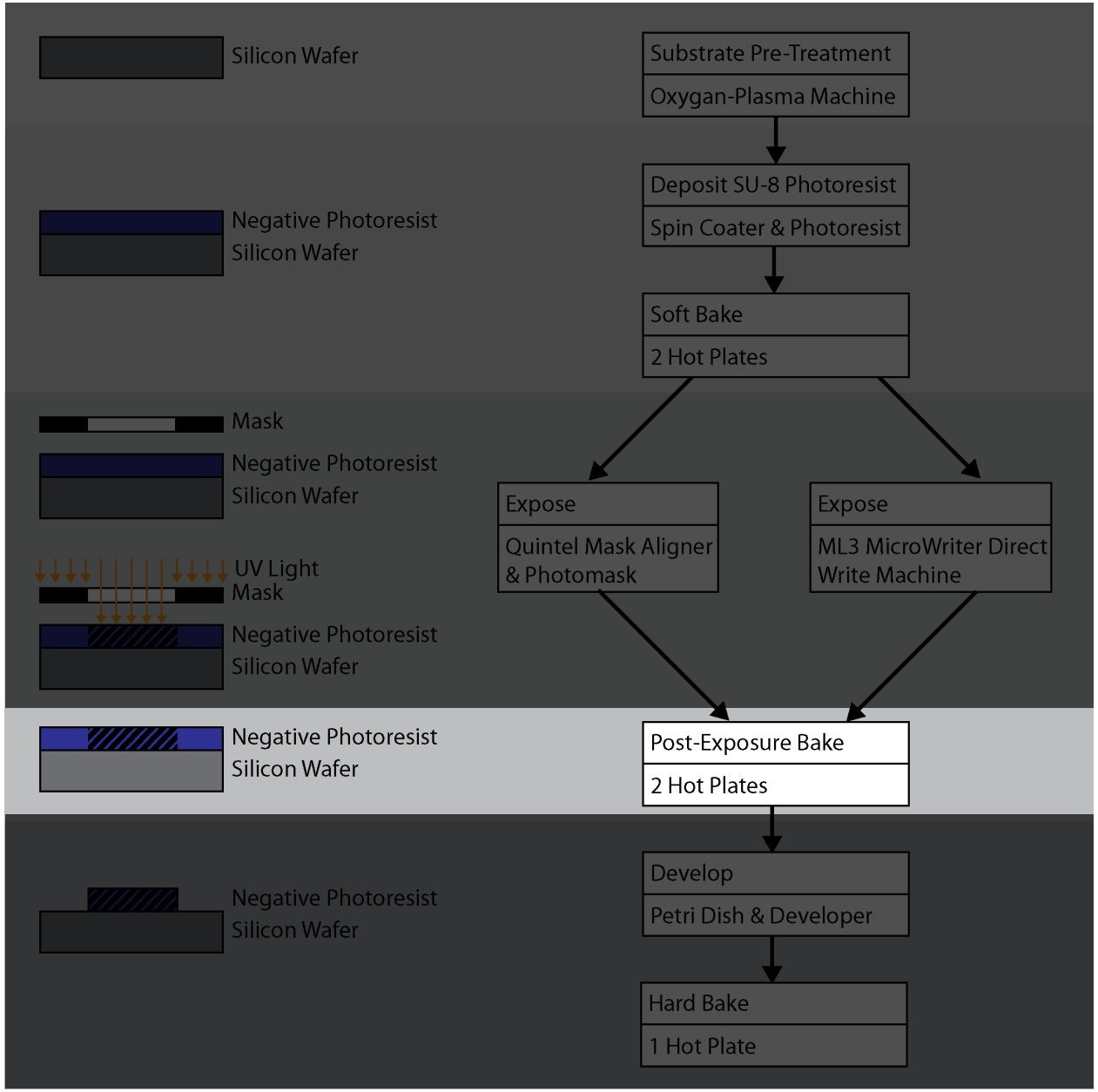
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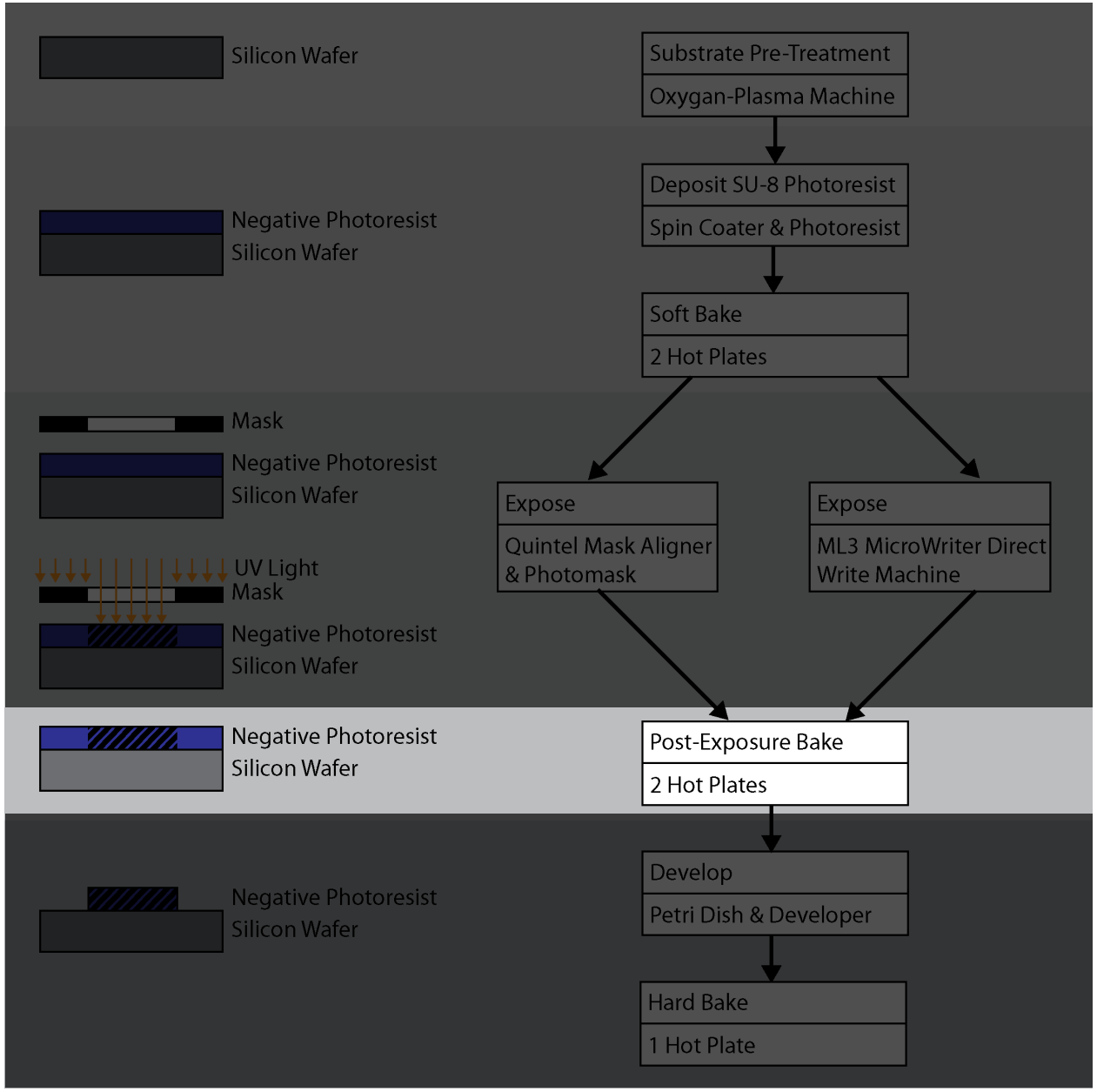
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DANGER
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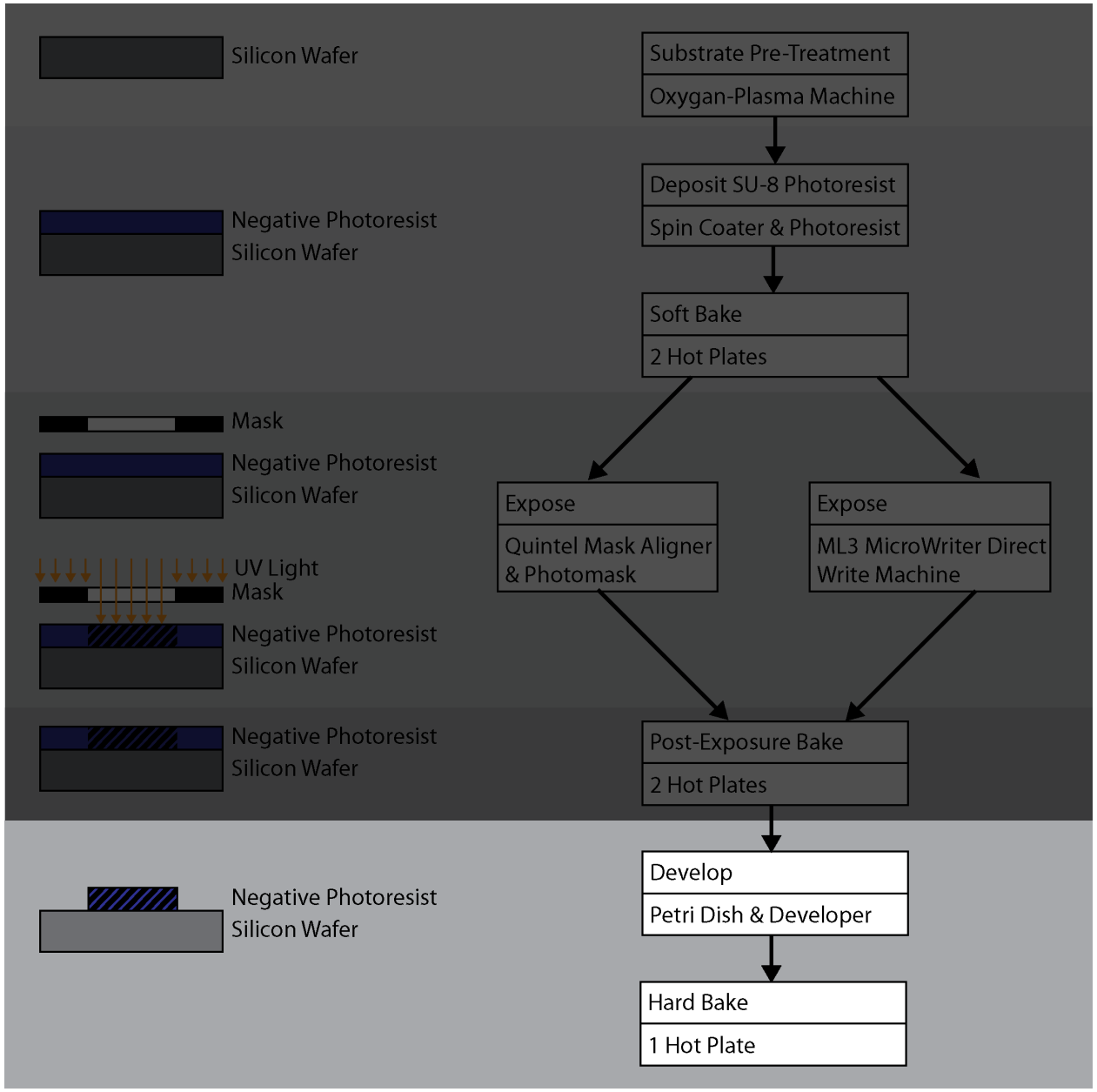
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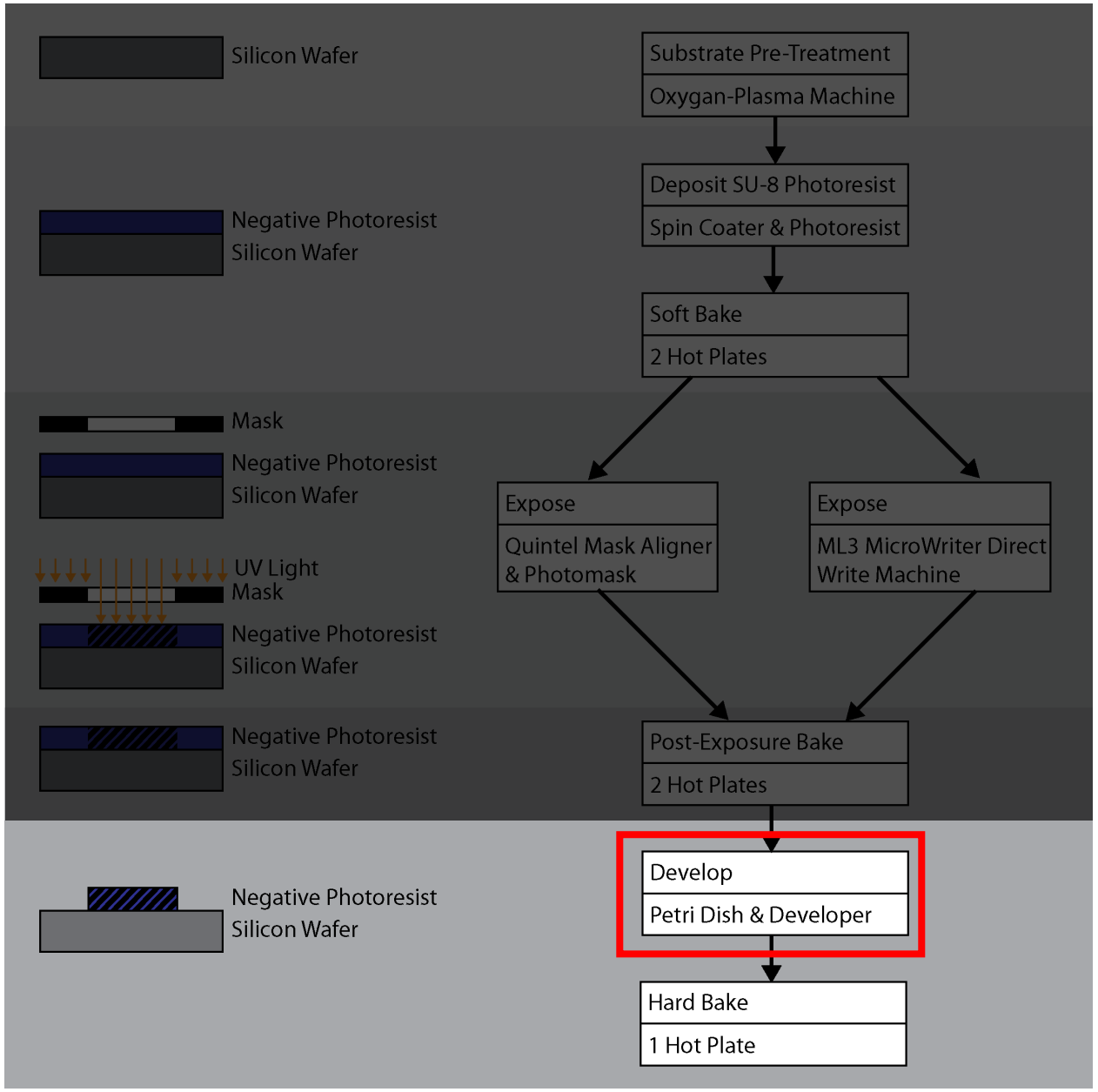
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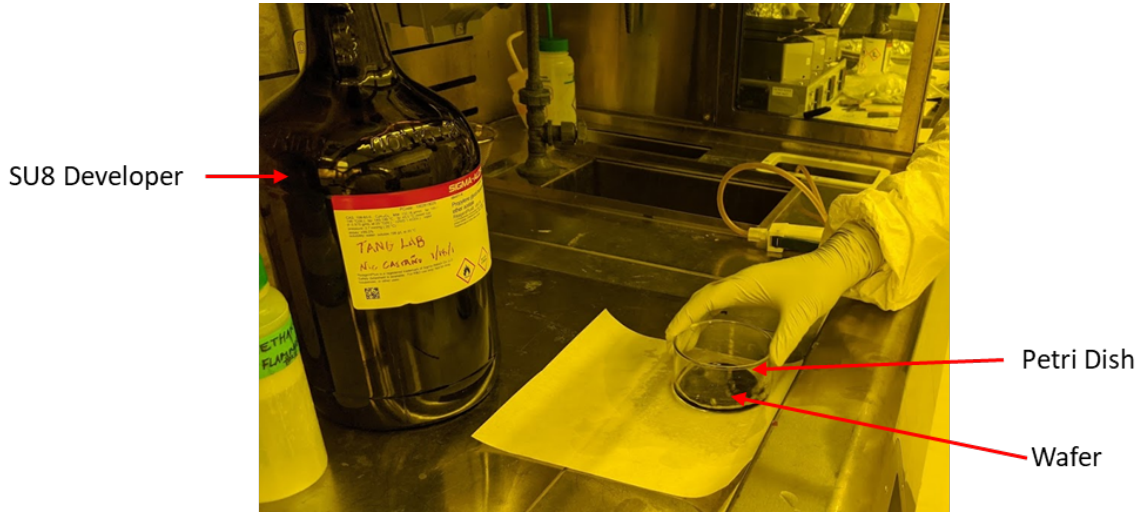
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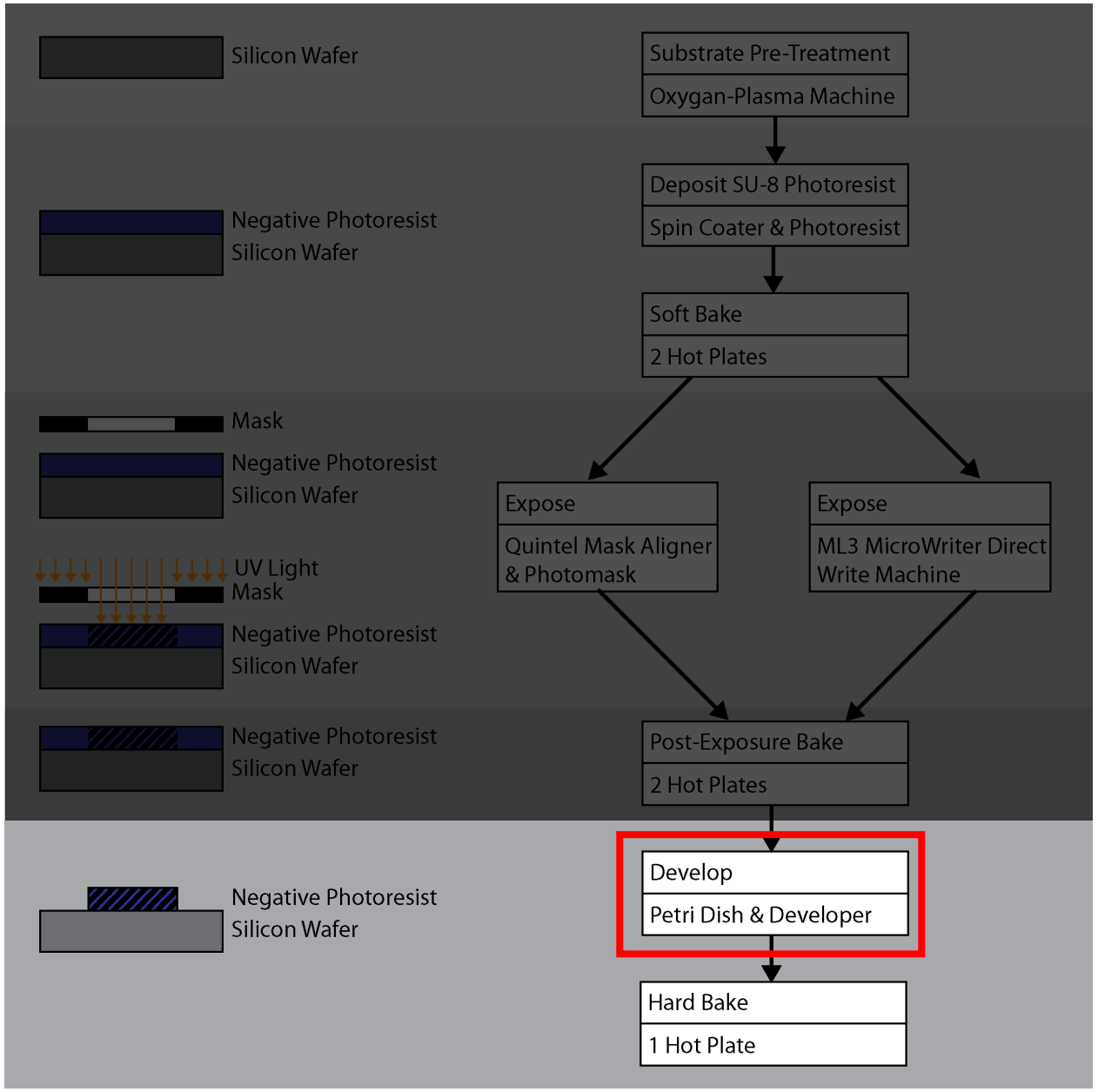
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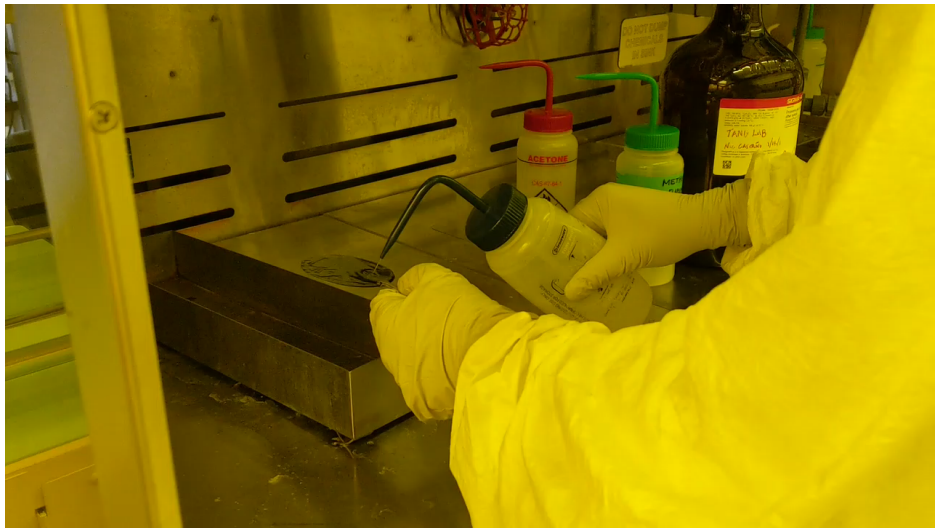
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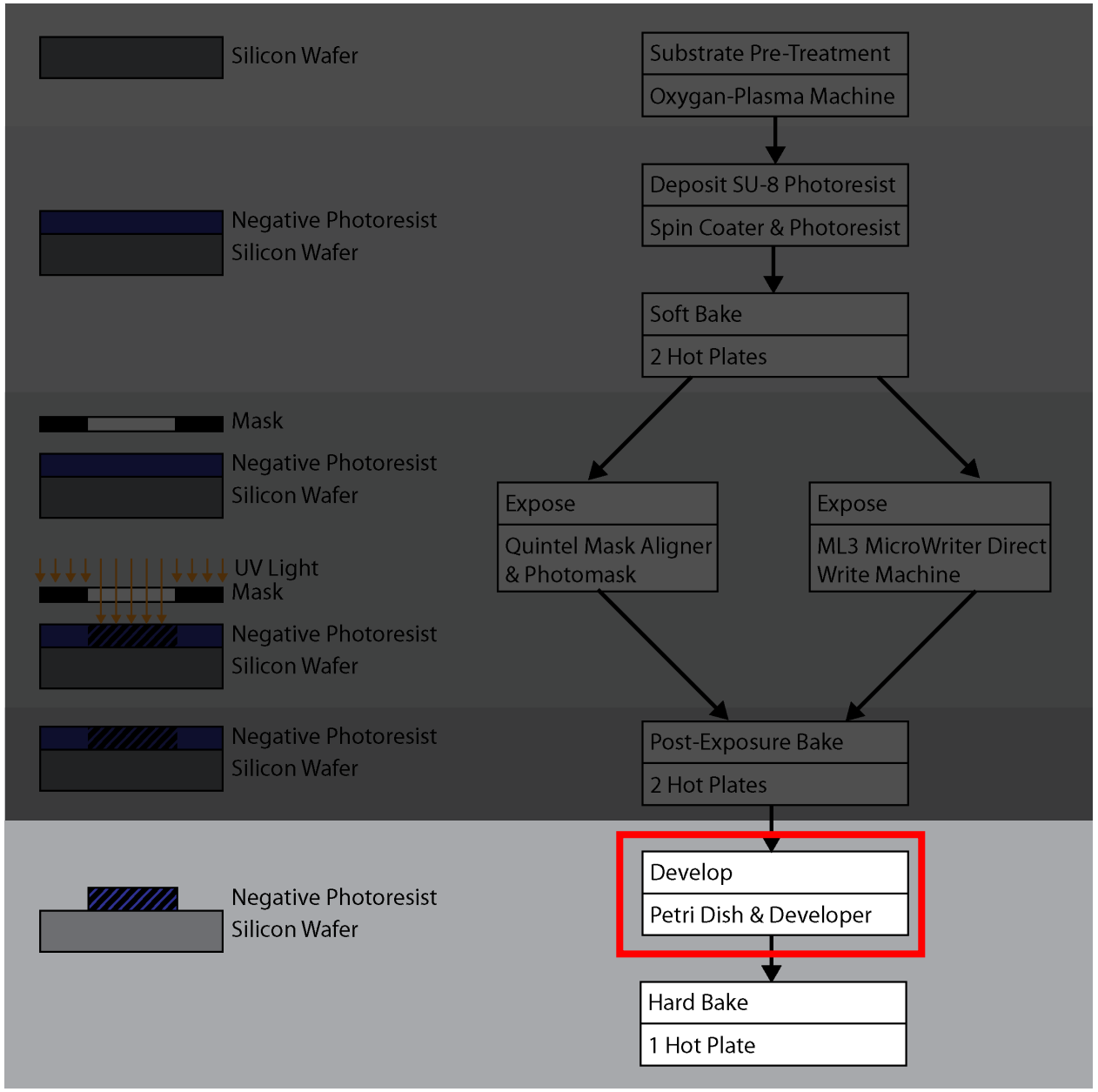
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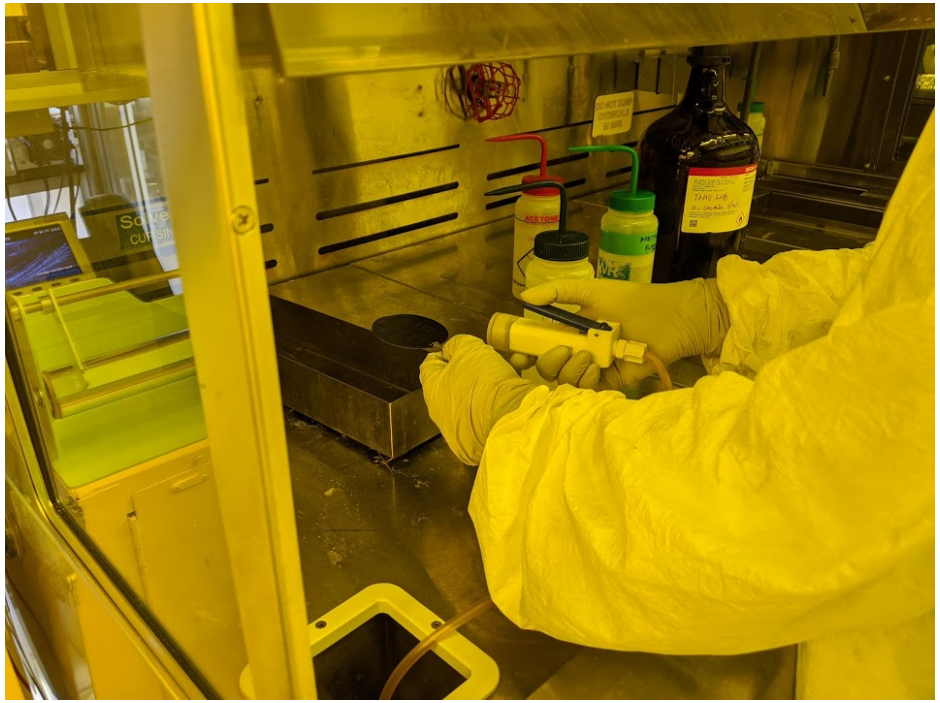
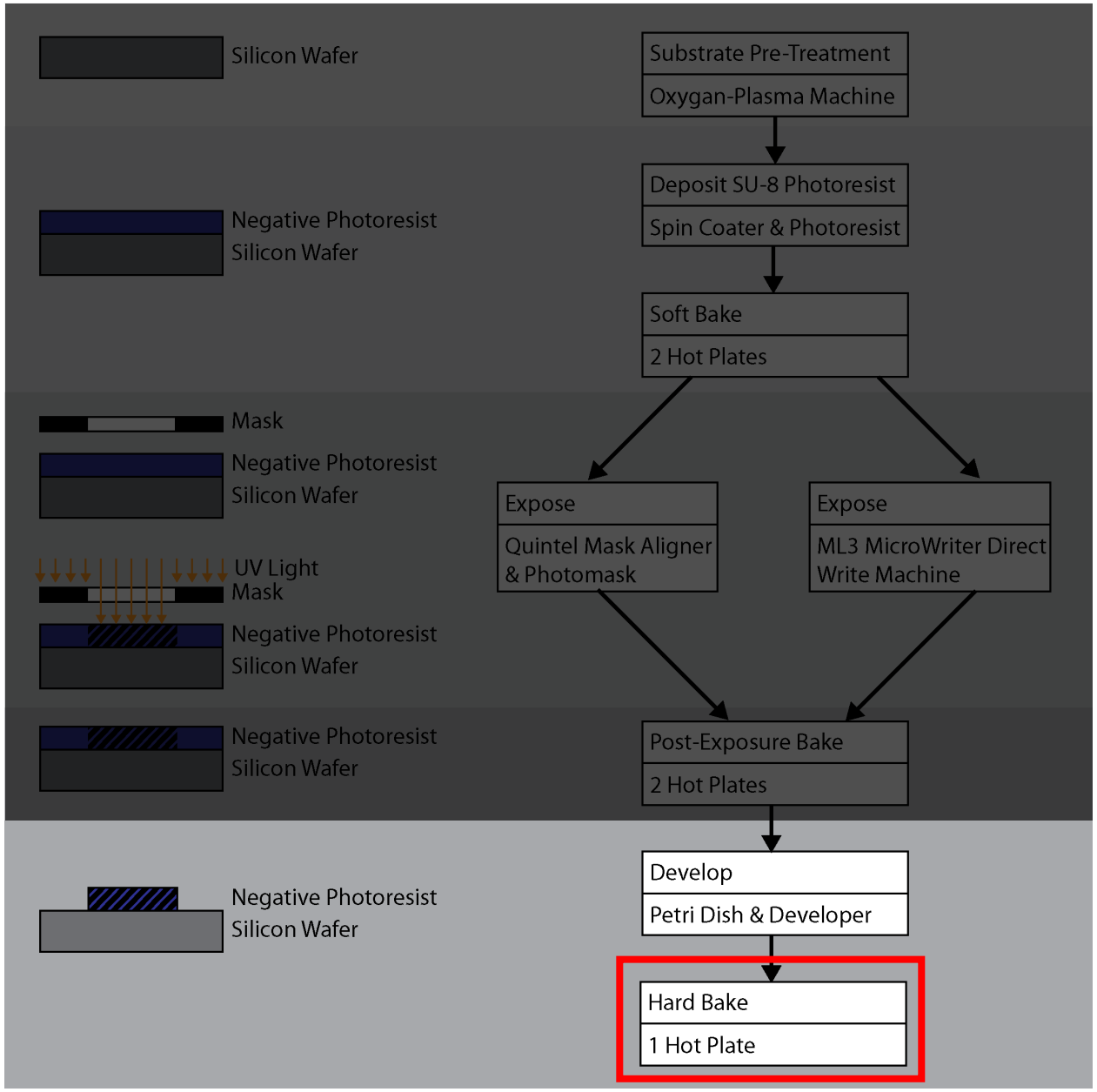
Substrate Pre-Treatment
Oxygan-Plasma Machine
Deposit SU-8 Photoresist
Spin Coater & Photoresist
Negative Photoresist
Silicon Wafer
Soft Bake
2 Hot Plates
Mask
Negative Photoresist
Silicon Wafer
Expose
Quintel Mask Aligner & Photomask
Expose
ML3 MicroWriter Direct Write Machine
UV Light
Mask
Negative Photoresist
Silicon Wafer
Negative Photoresist
Silicon Wafer
Post-Exposure Bake
2 Hot Plates
Develop
Petri Dish & Developer
Negative Photoresist
Silicon Wafer
Hard Bake
1 Hot Plate

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Hard Bake
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DANGER
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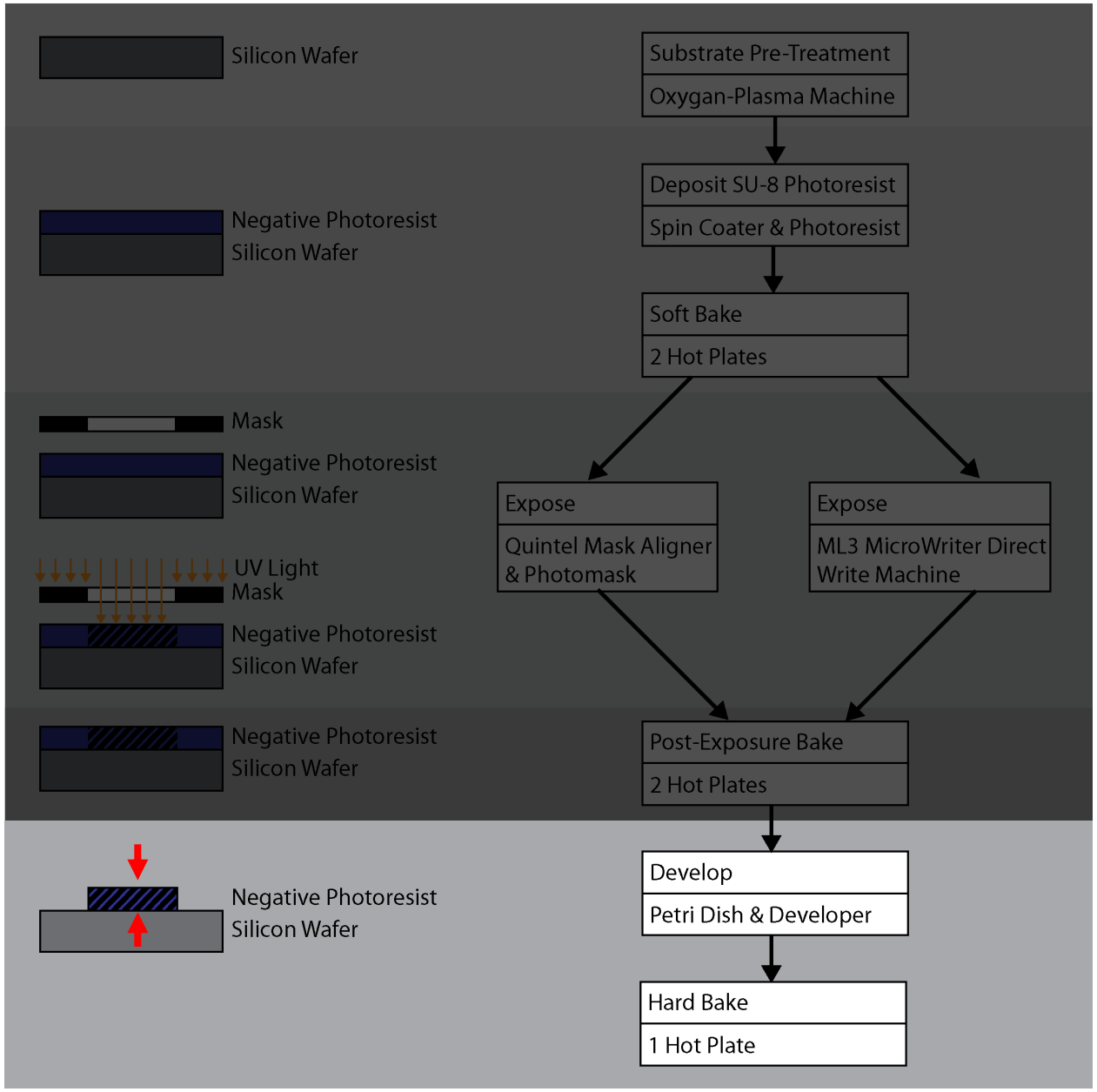
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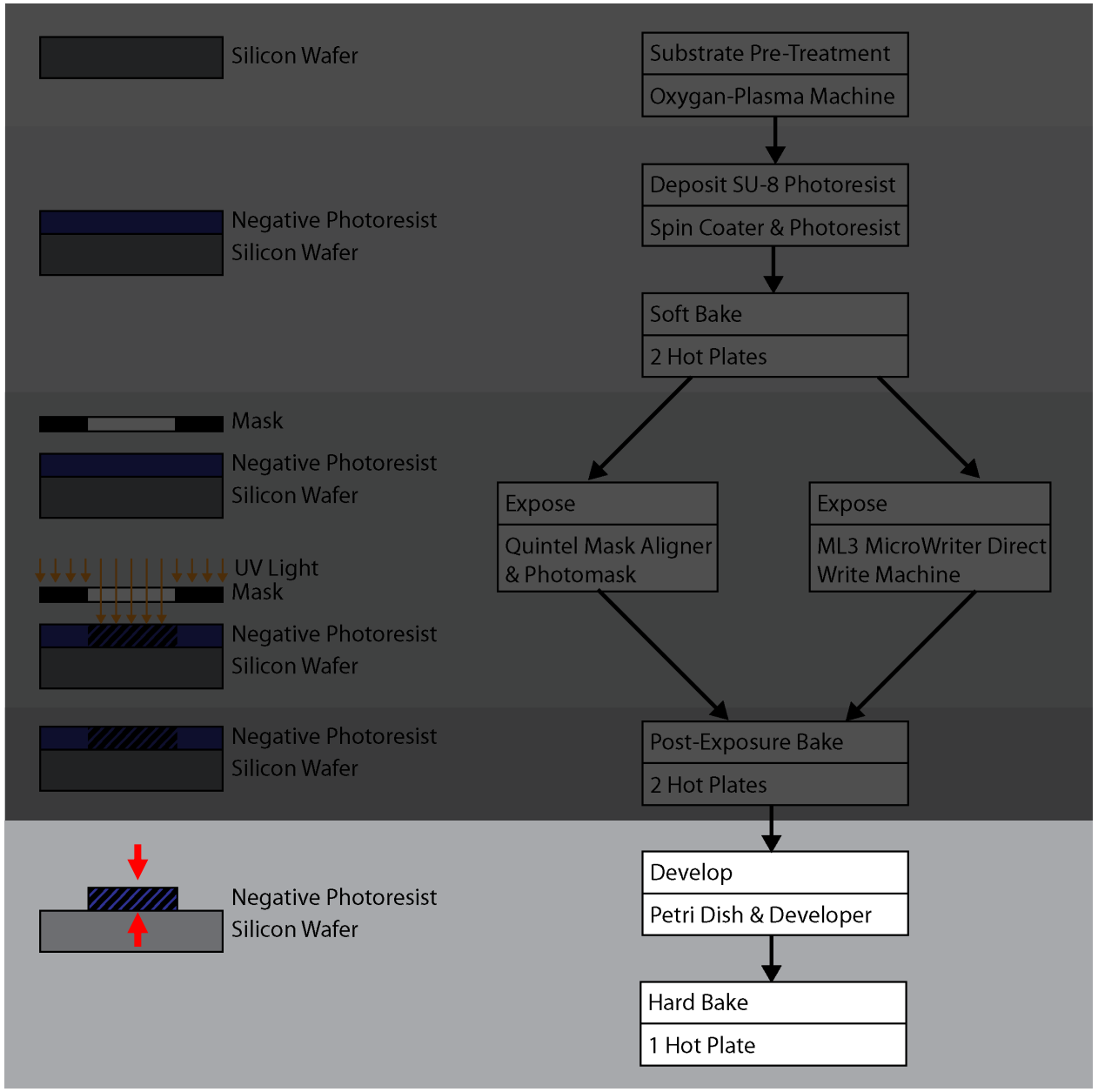
Silicon Wafer
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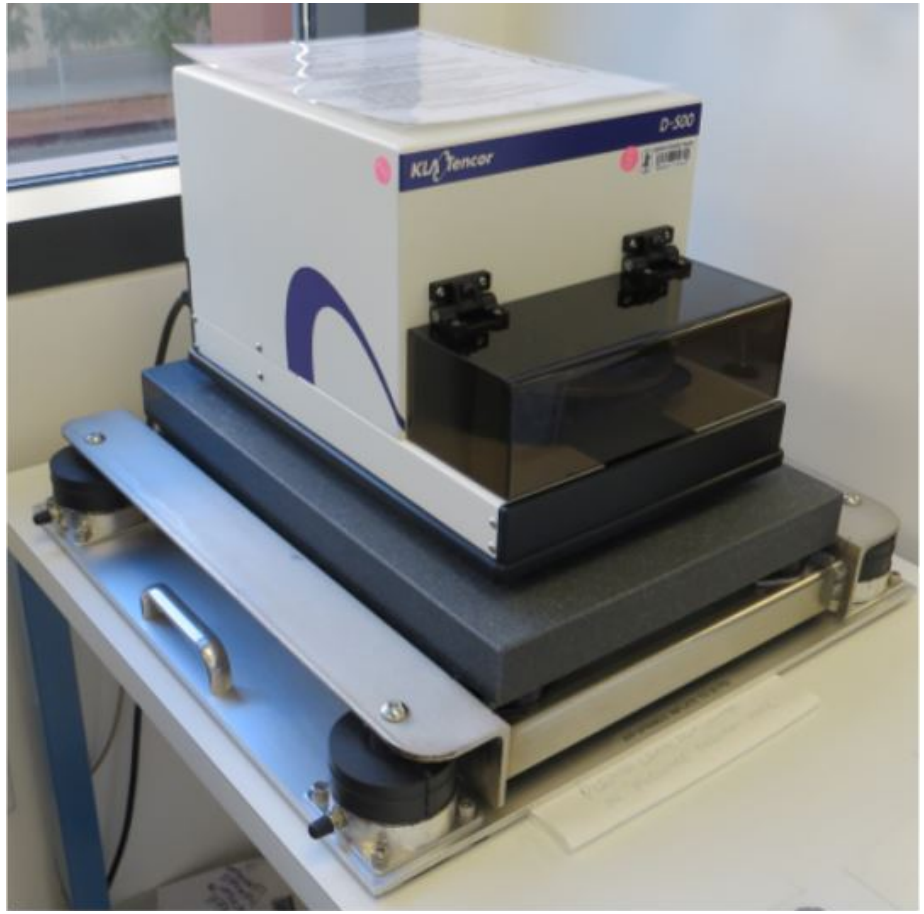
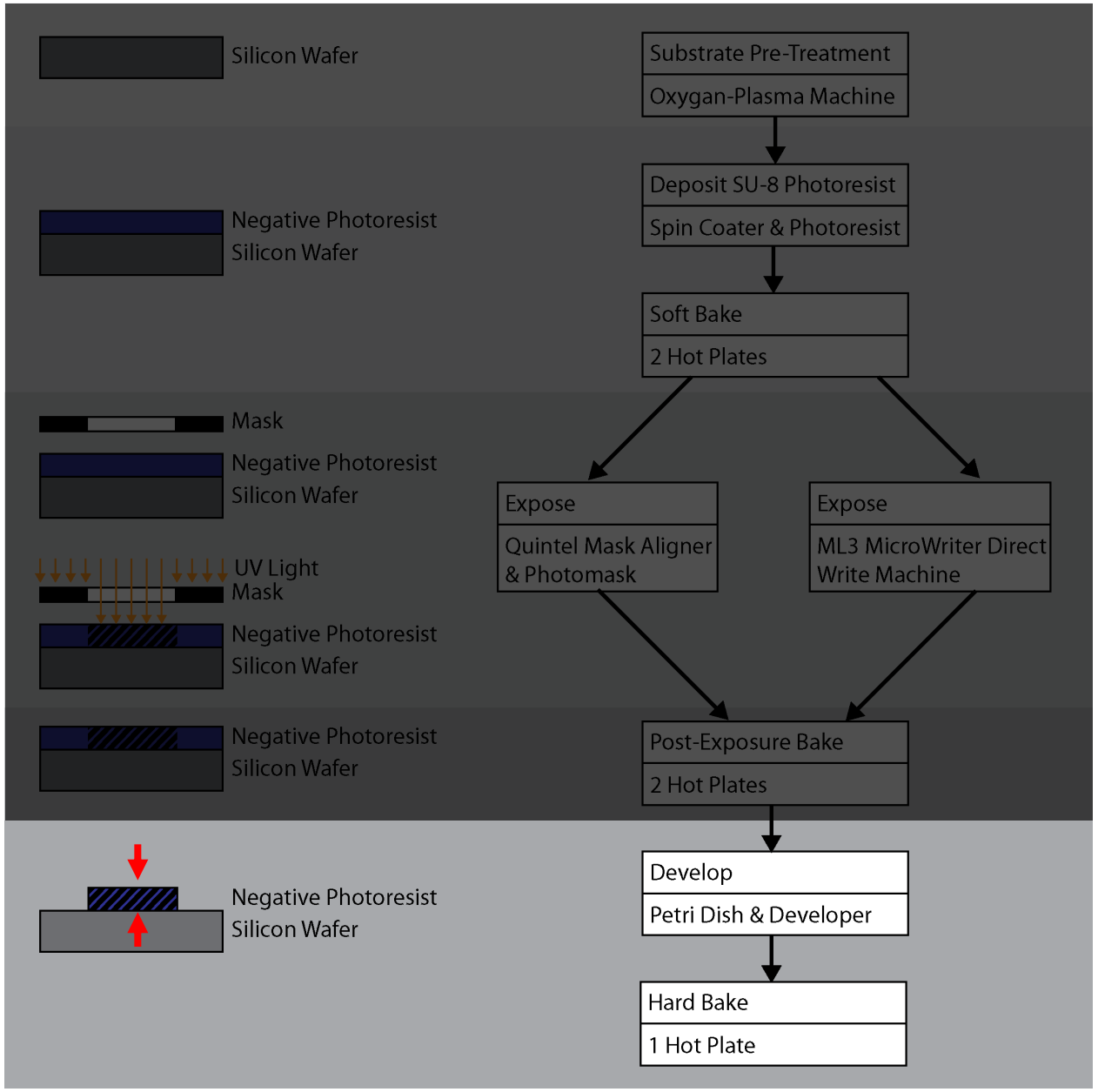

KLA Tencor
D-500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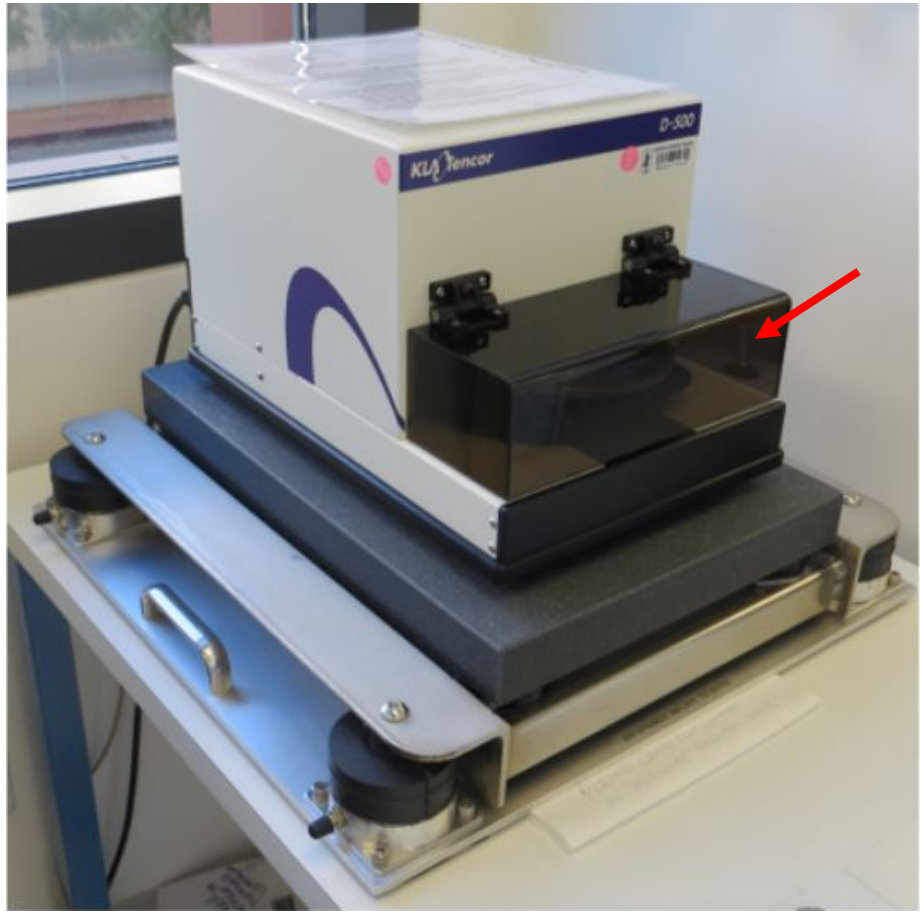
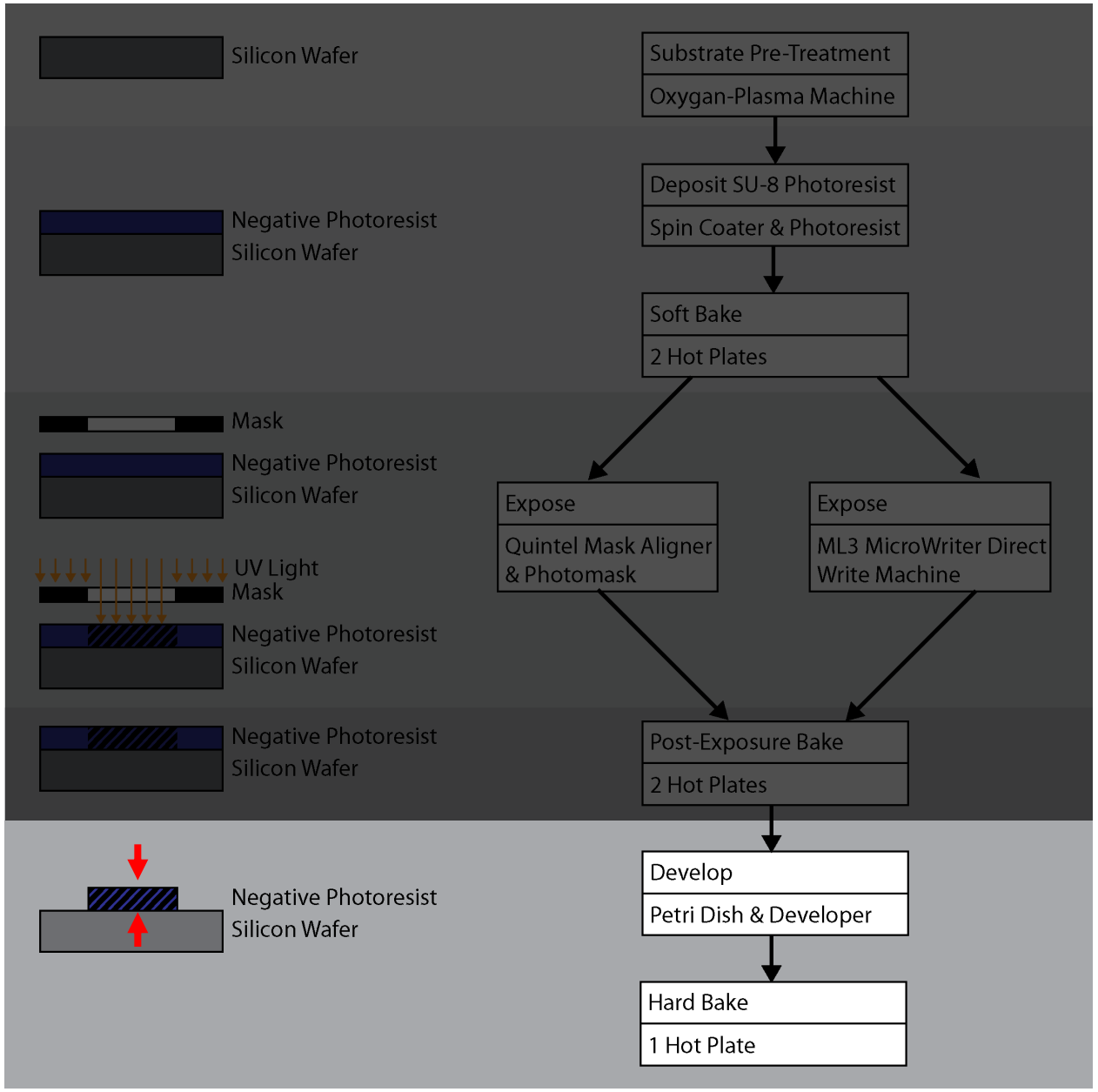
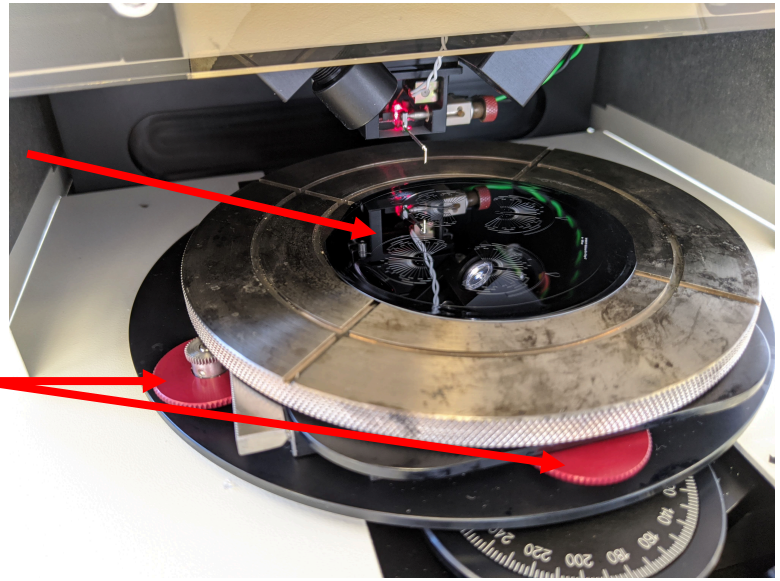
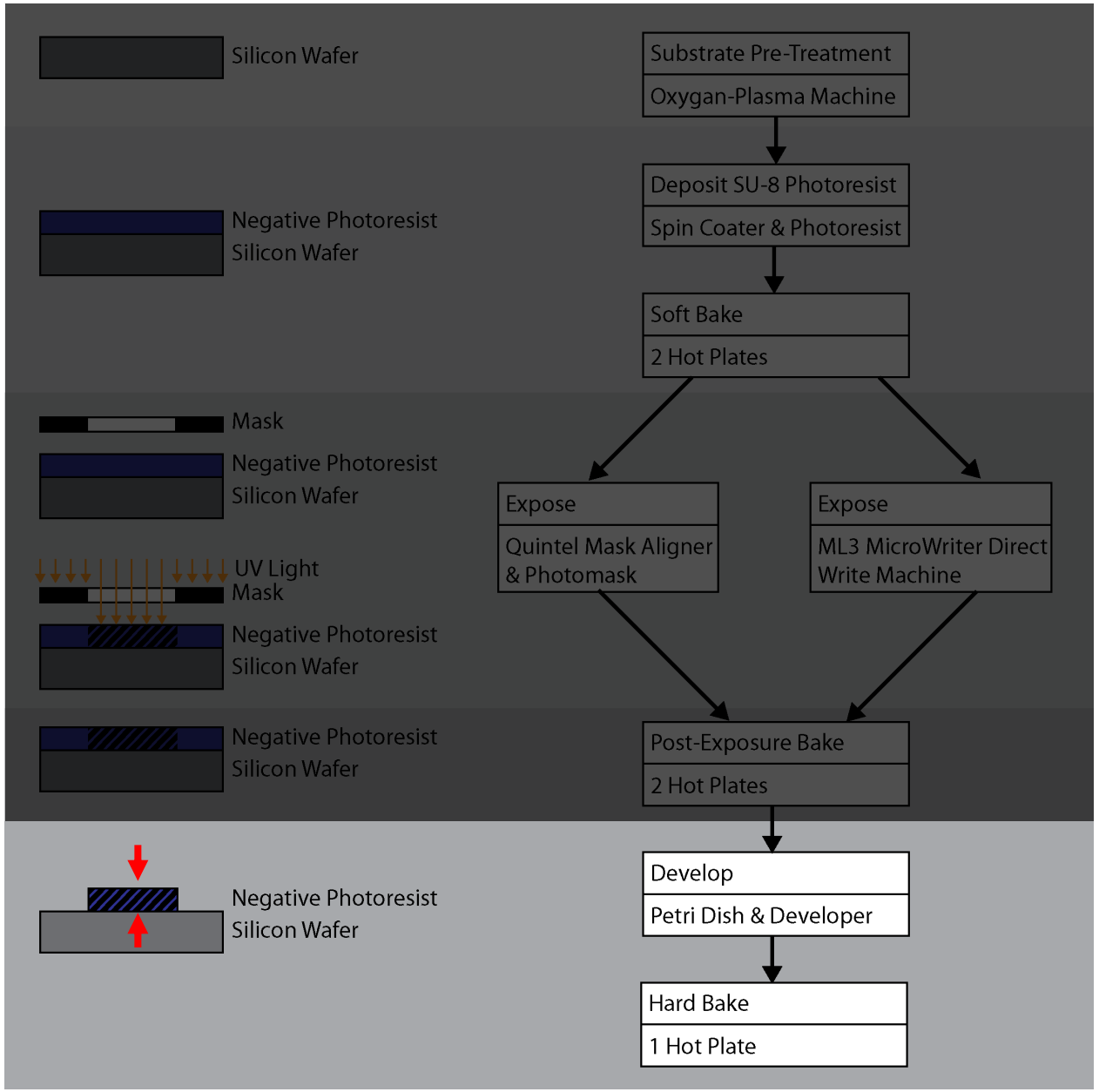

KLA Tencor
D-500



Wafer with SU-8

Use red knobs to manually steer in X and Y direction





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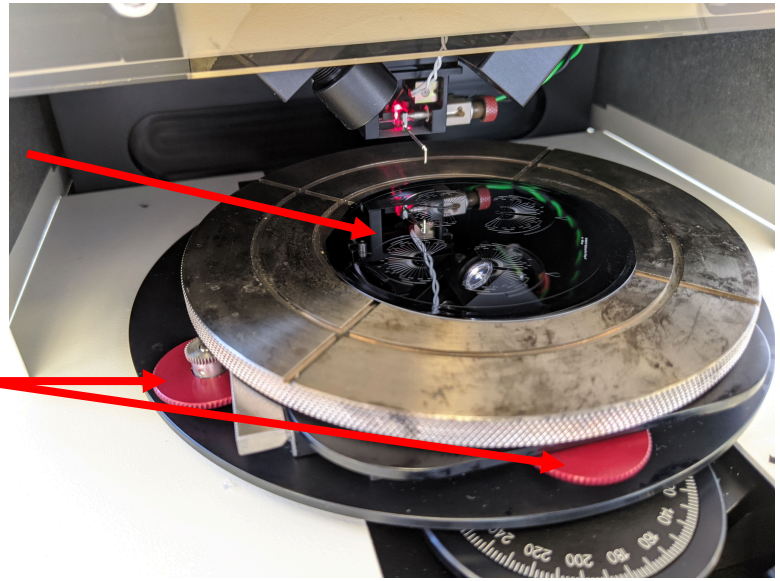

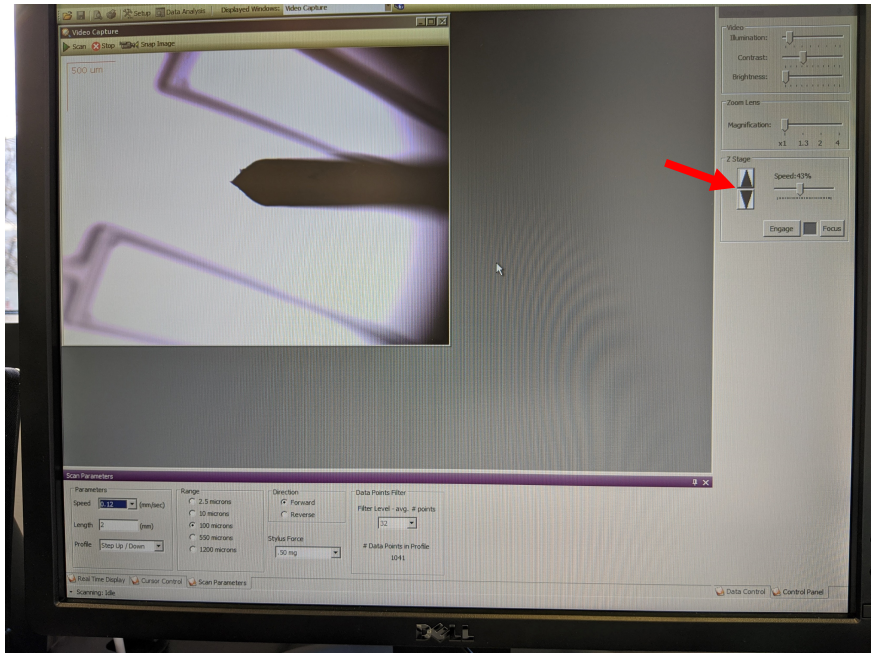

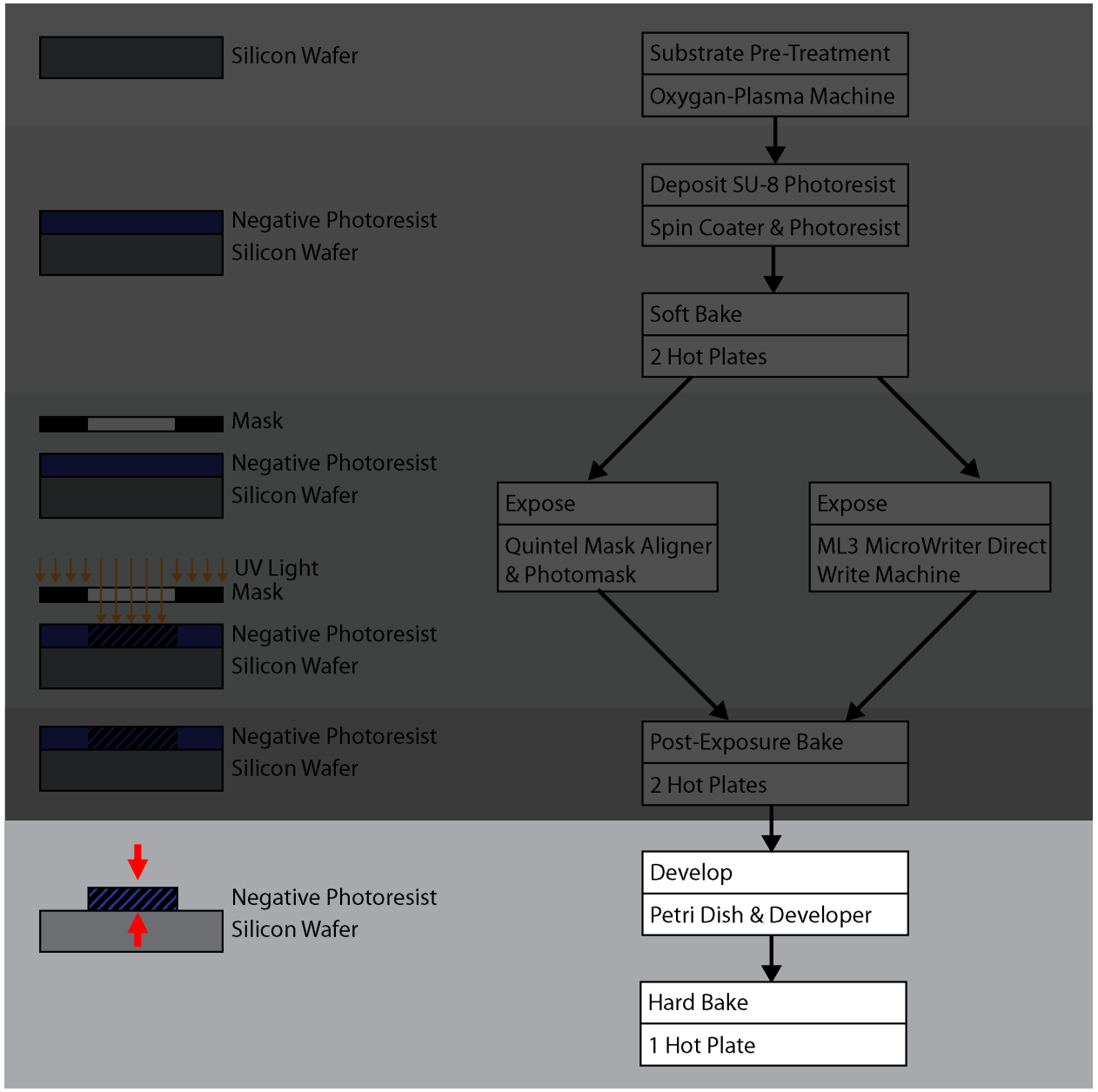
Silicon Wafer
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Oxygan-Plasma Machine
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Spin Coater & Photoresist
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ML3 MicroWriter Direct Write Machine
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Silicon Wafer
Negative Photoresist
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Petri Dish & Developer
Negative Photoresist
Silicon Wafer
Hard Bake
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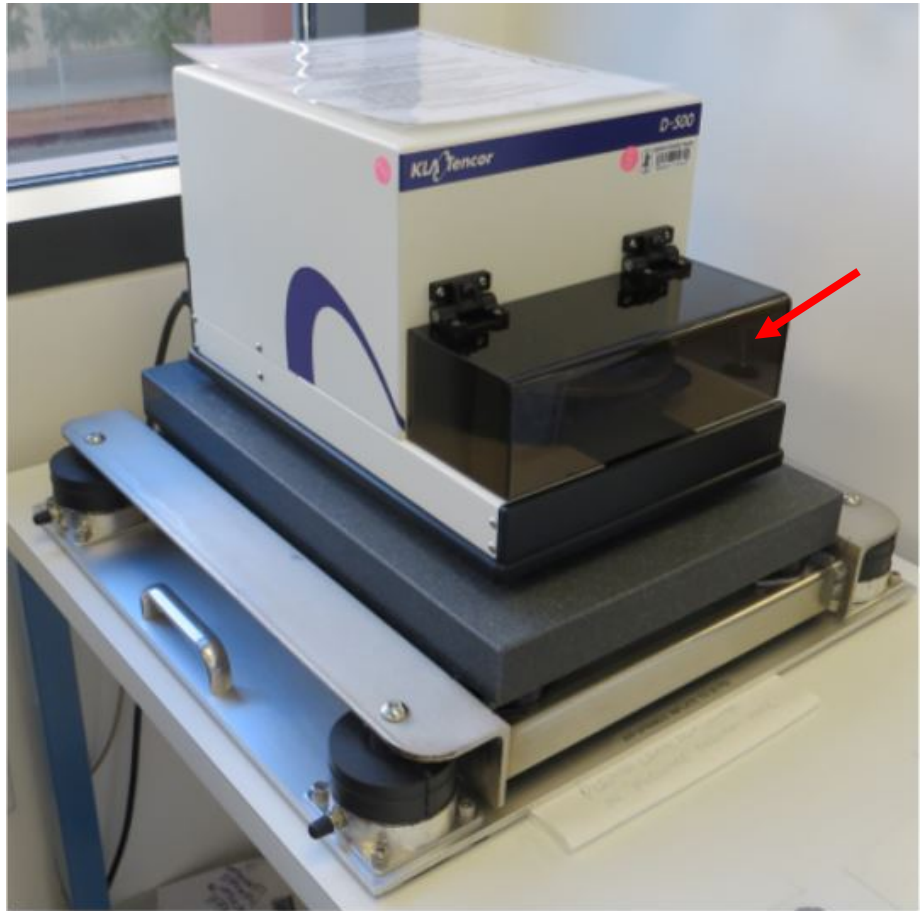
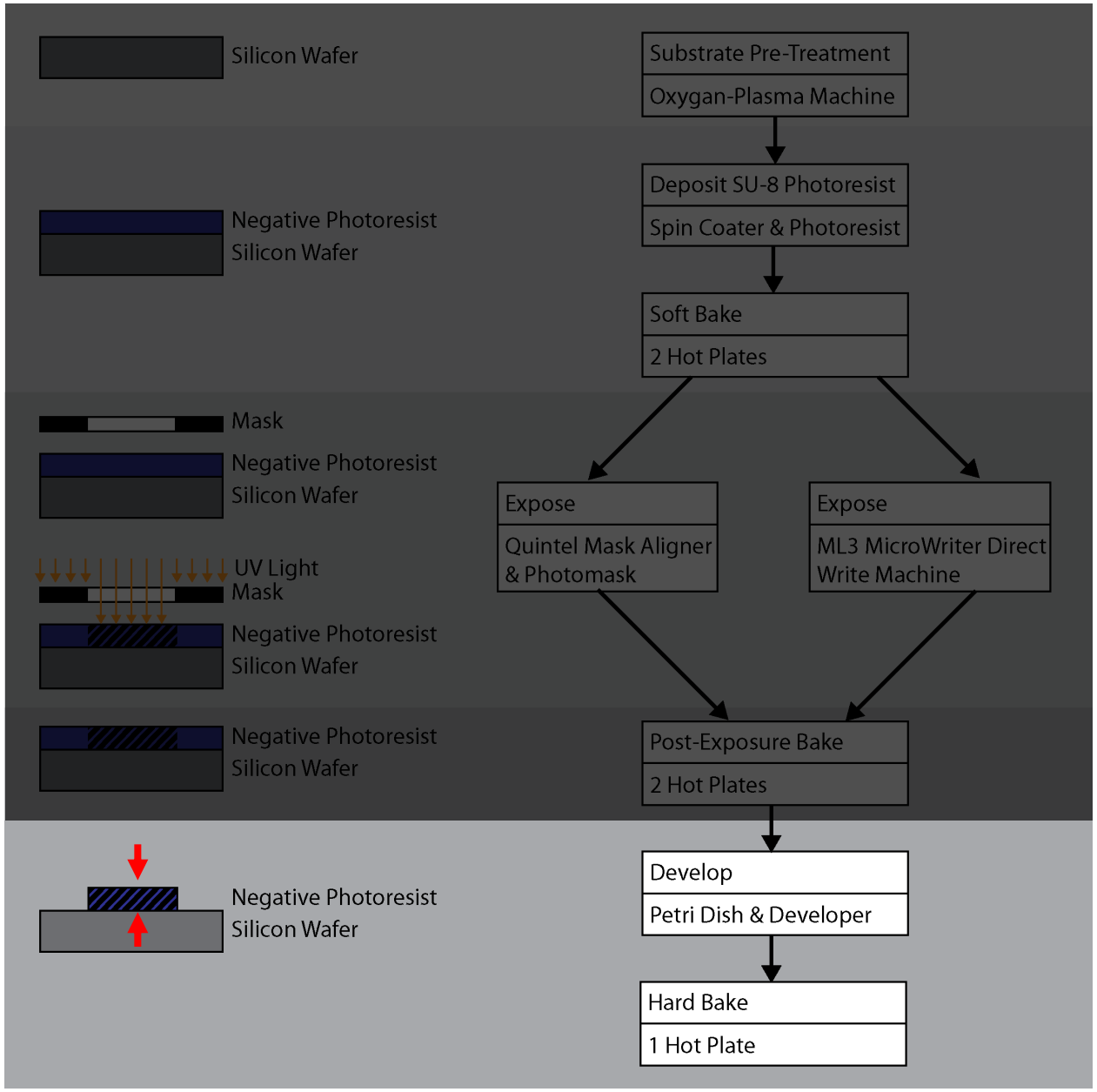

KLA Tencor
D-500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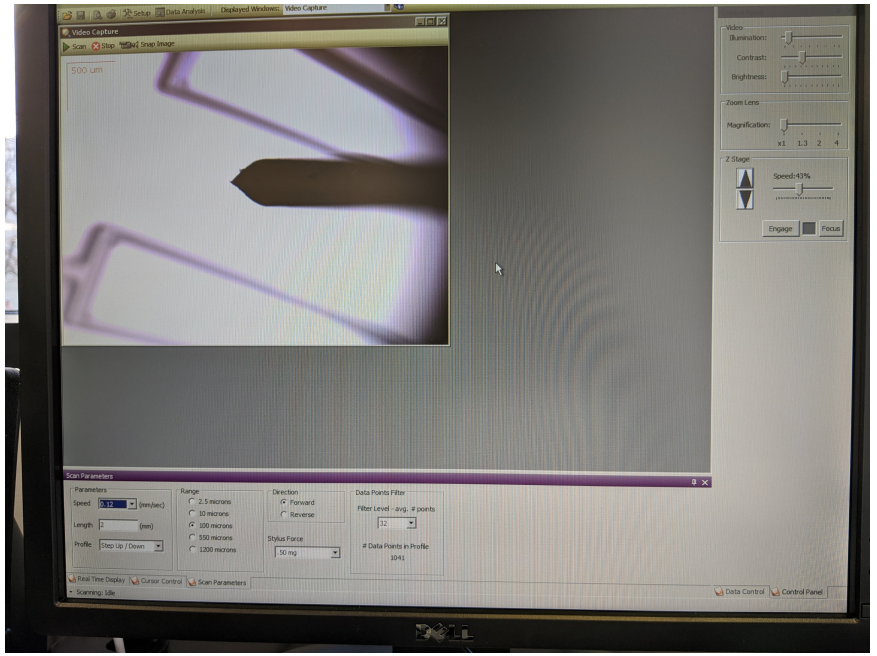

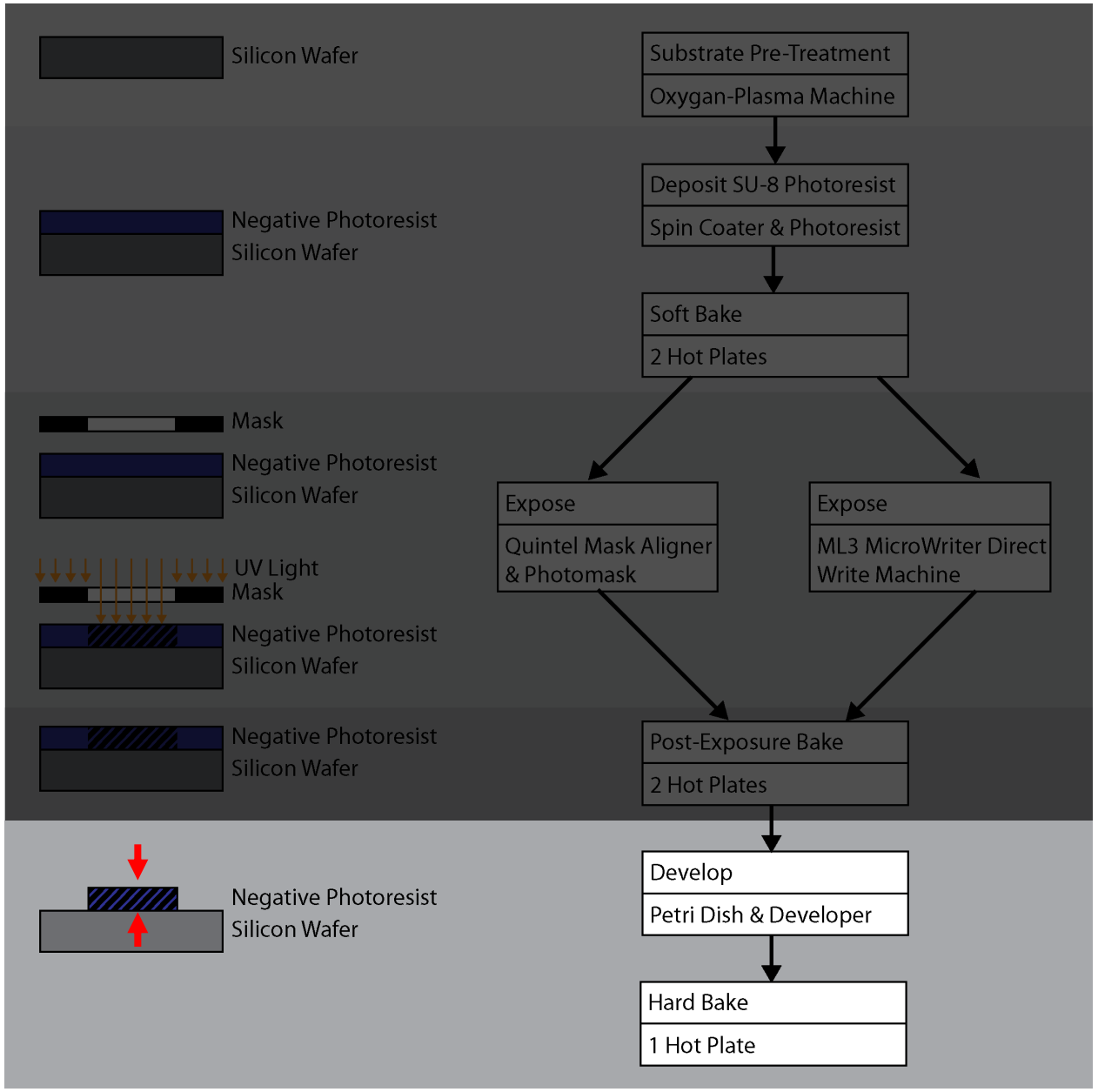
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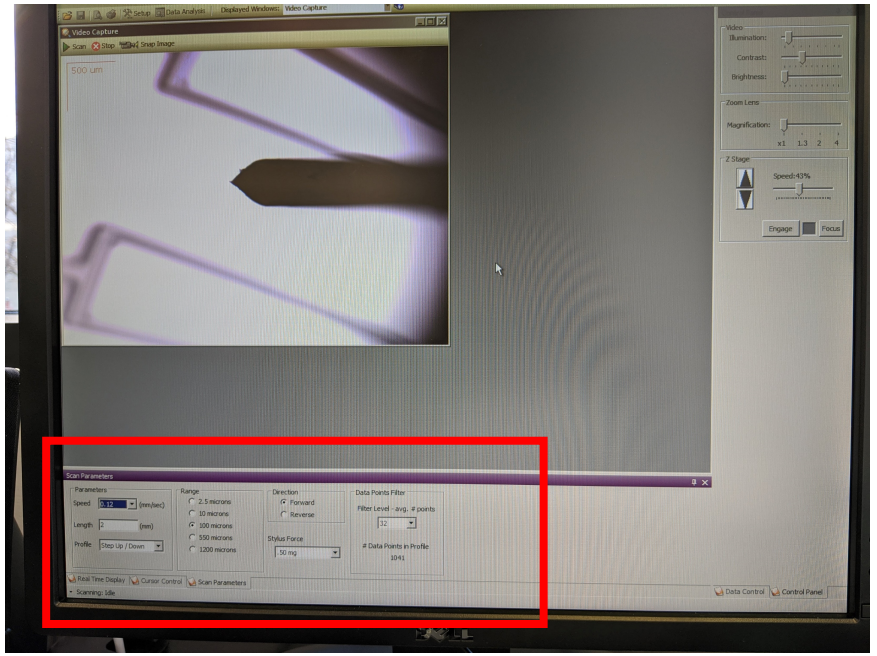

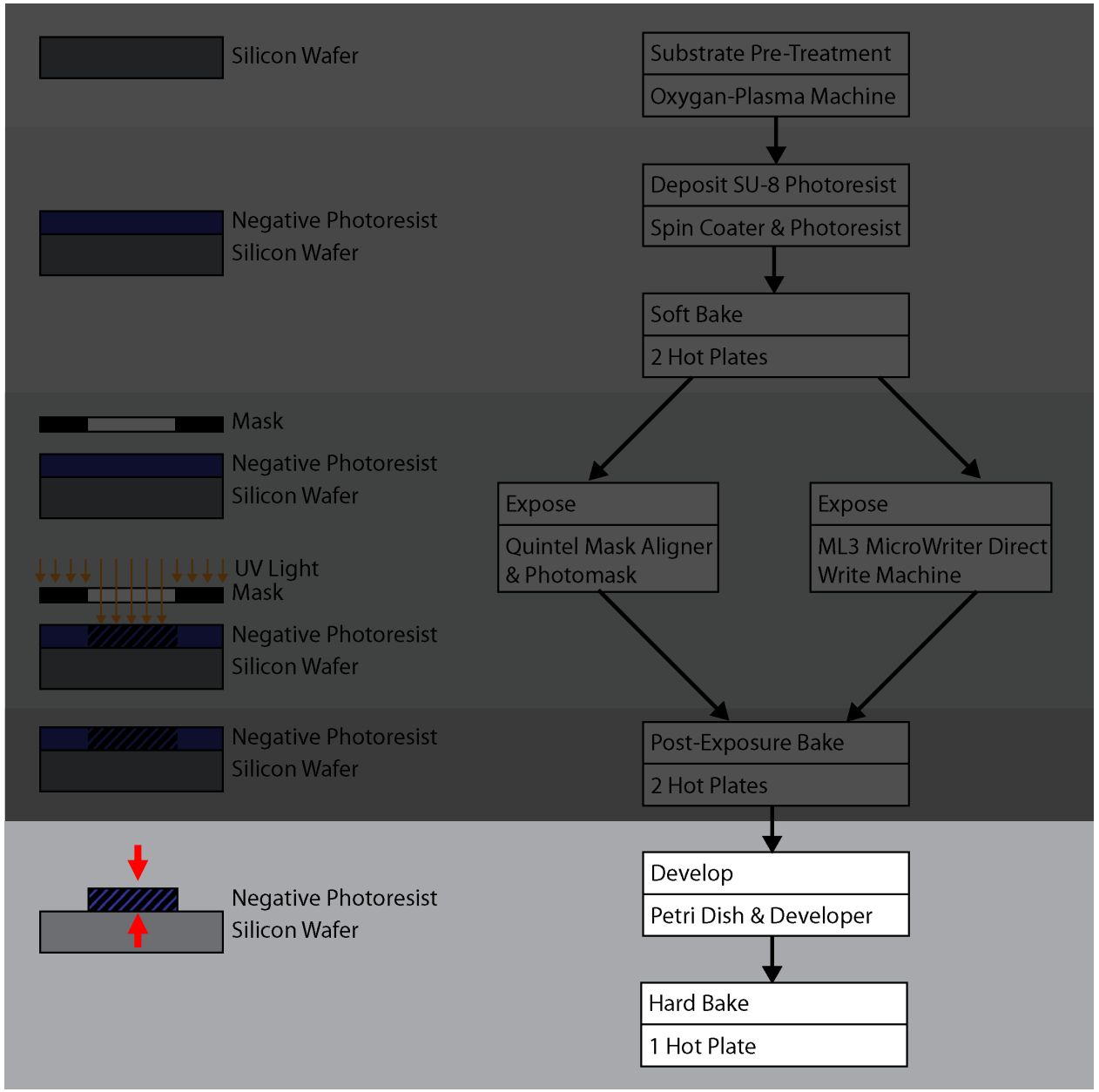
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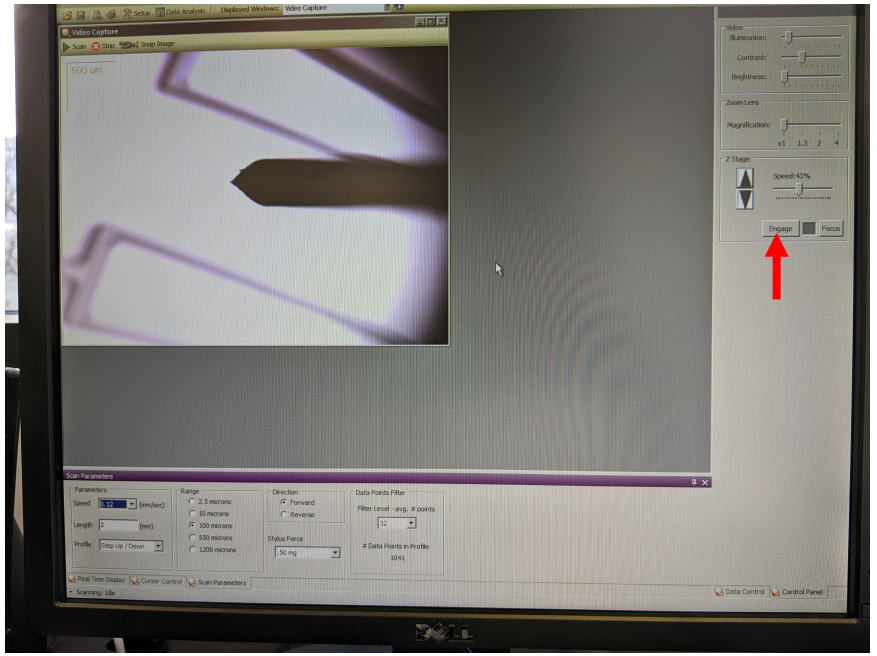

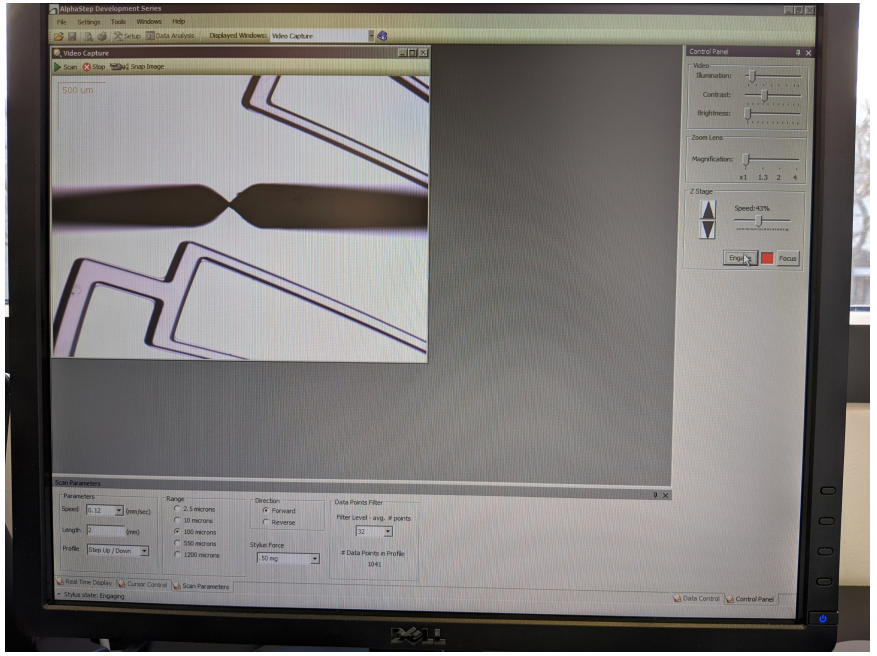

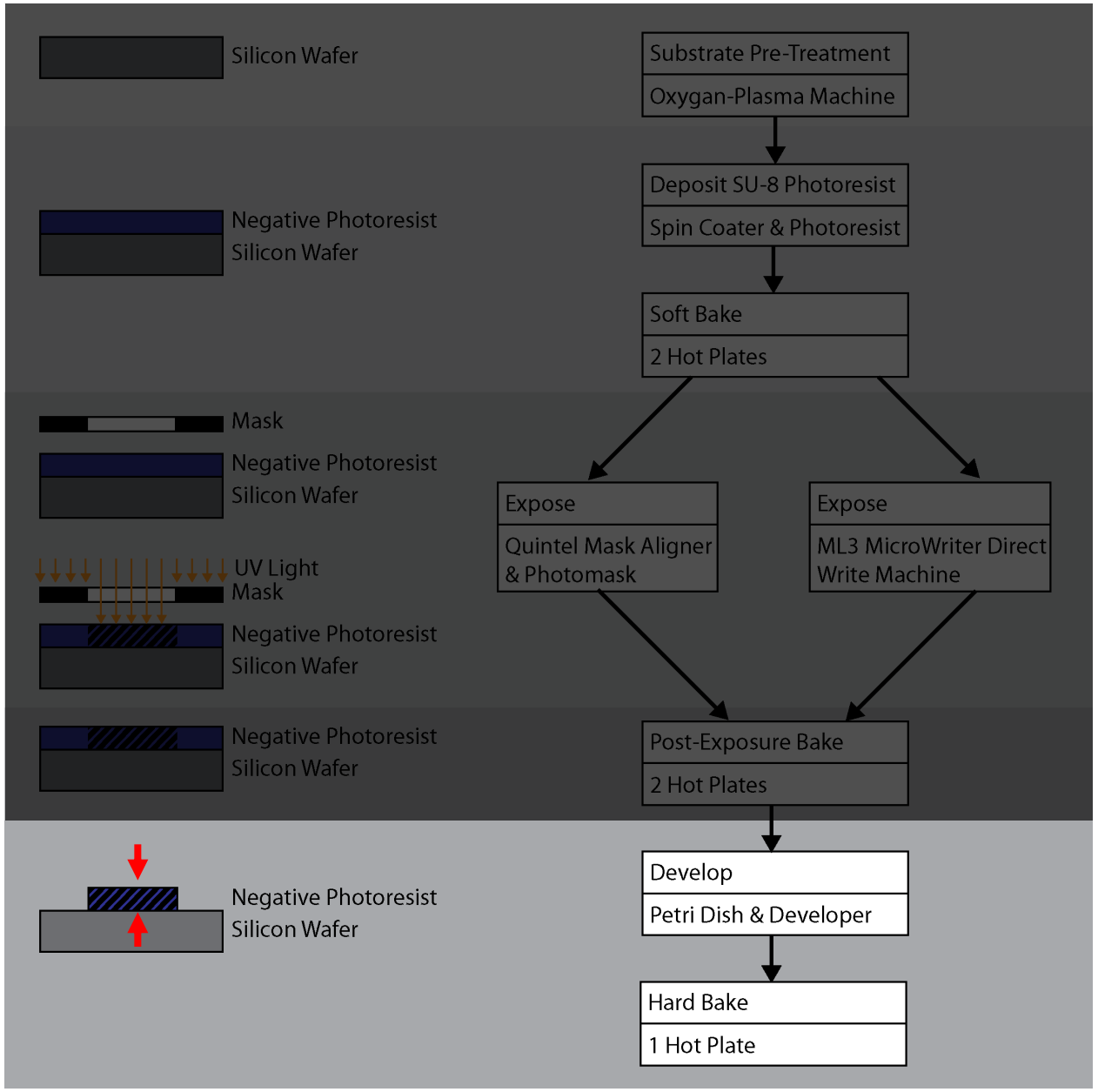
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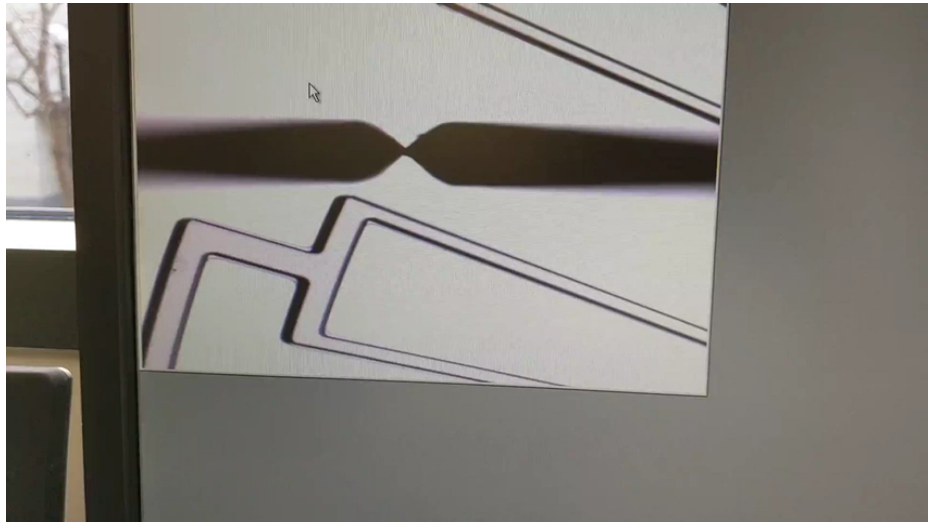

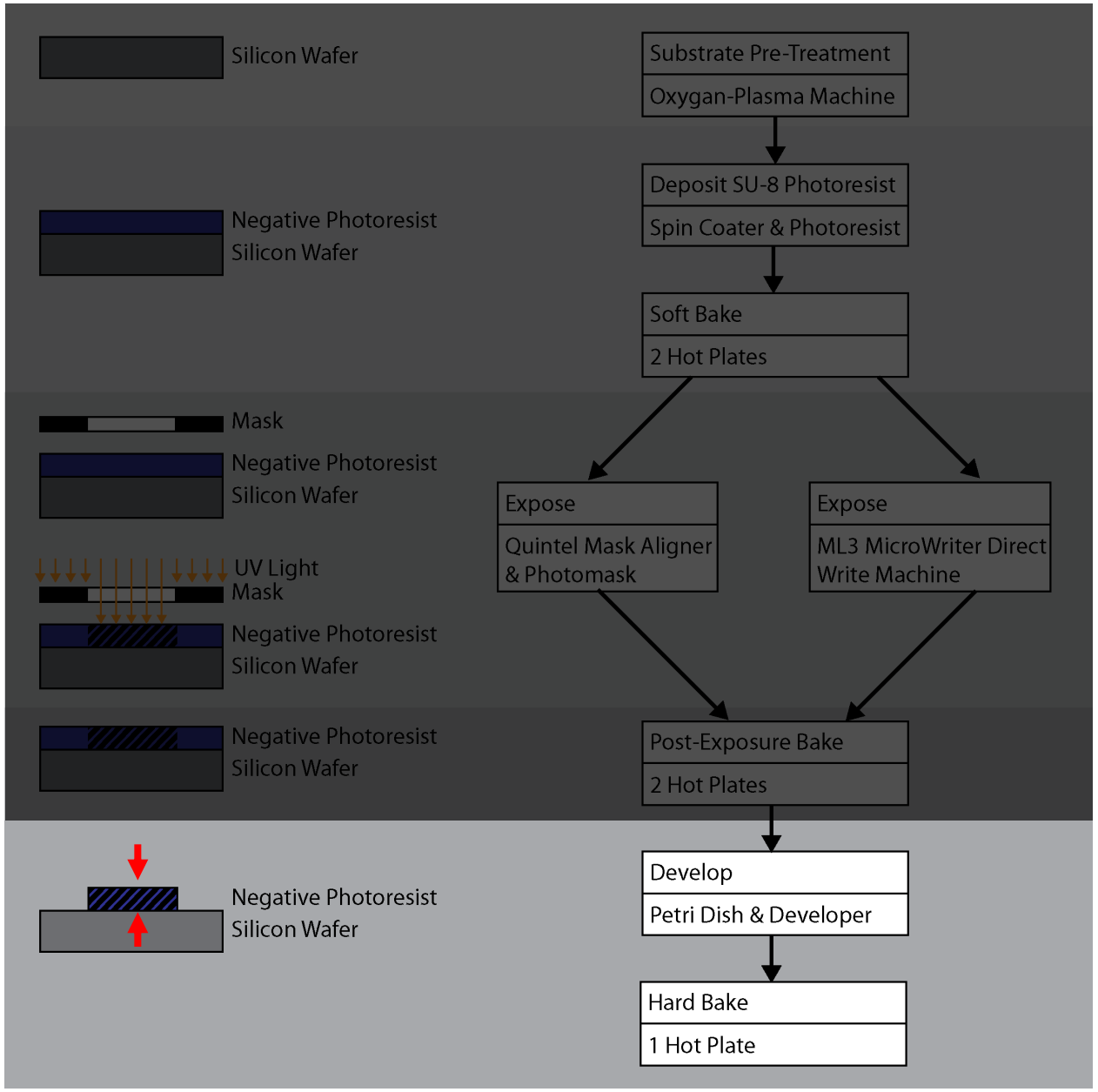
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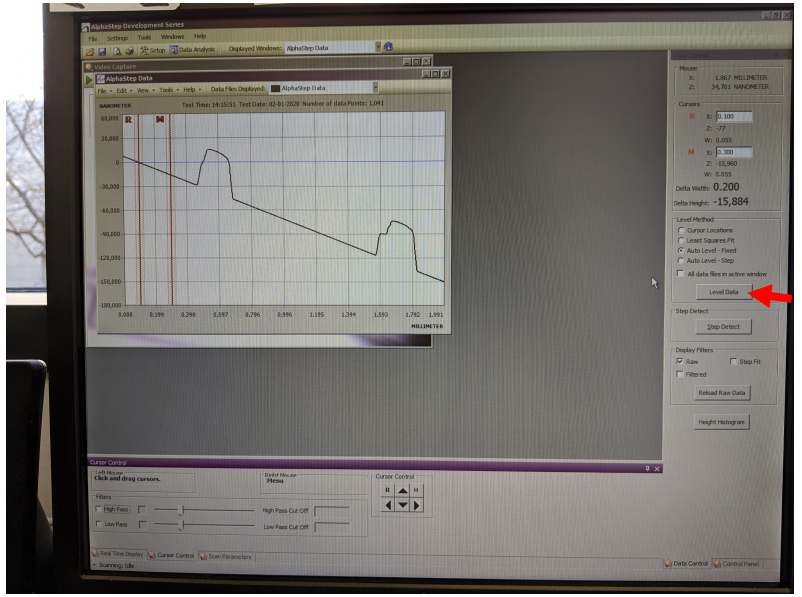

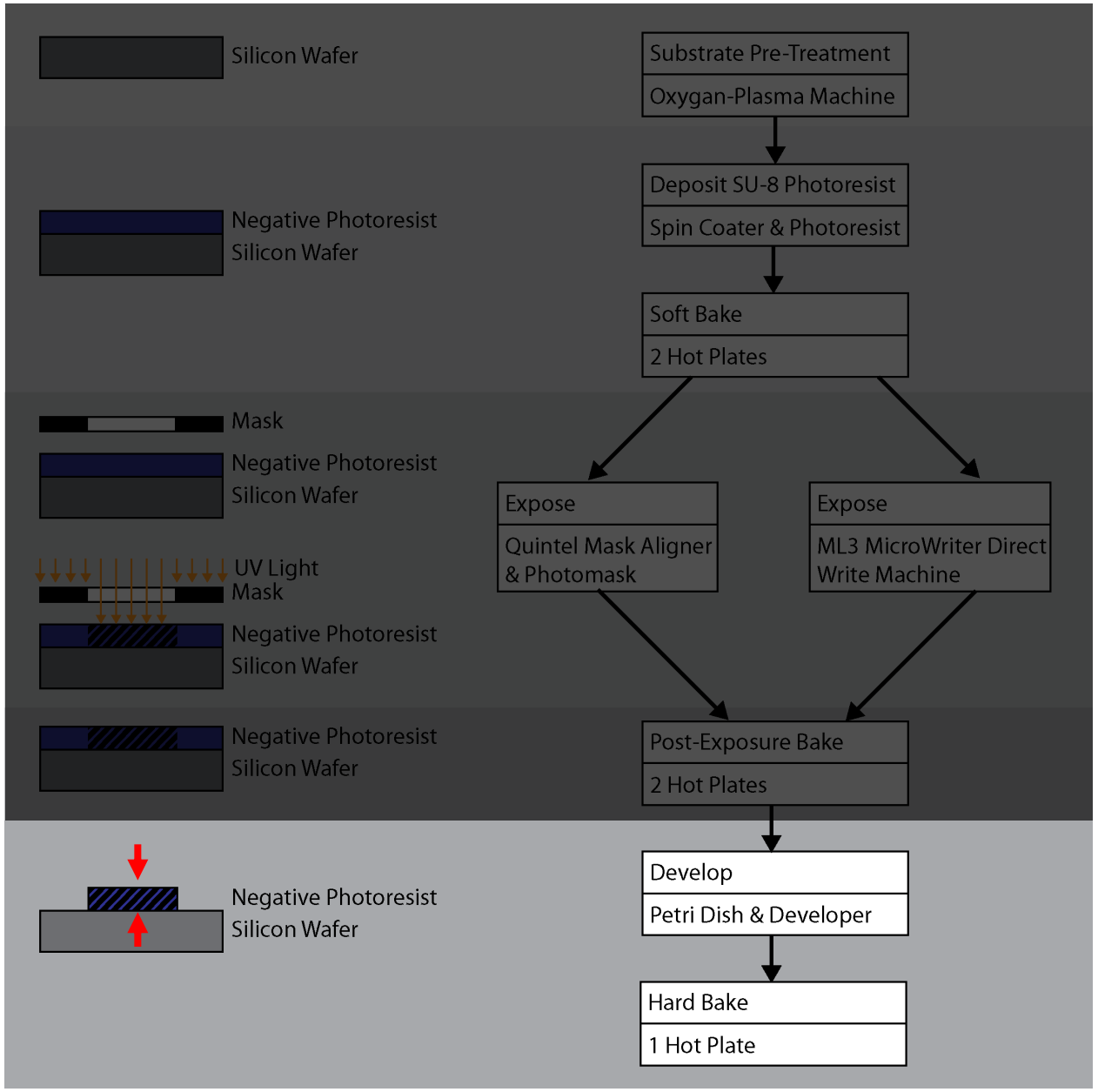
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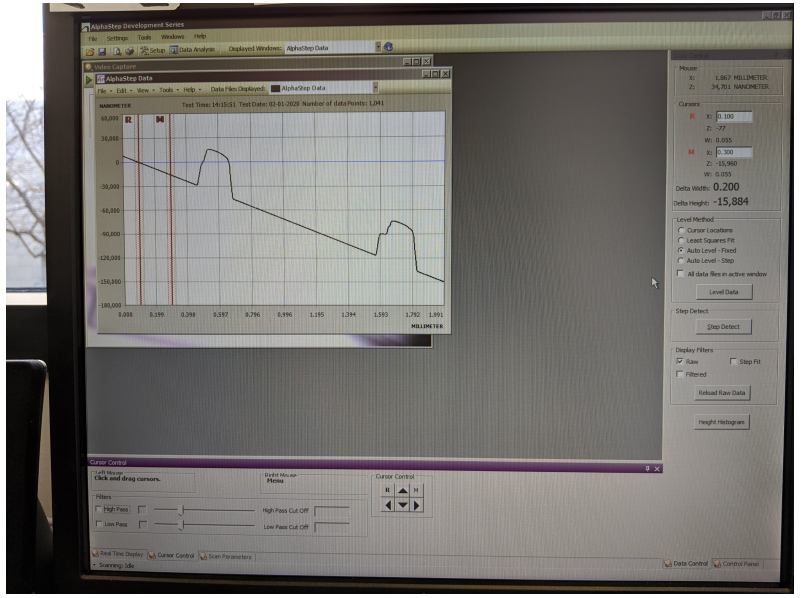

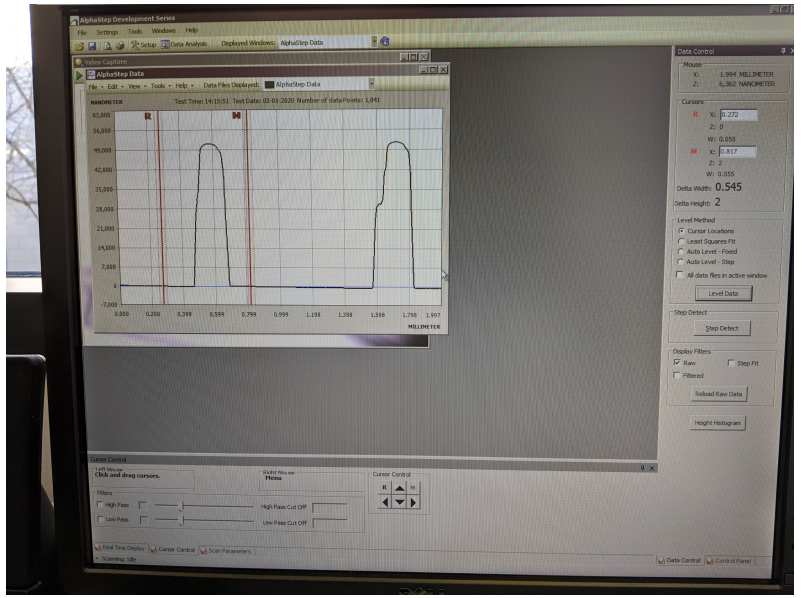

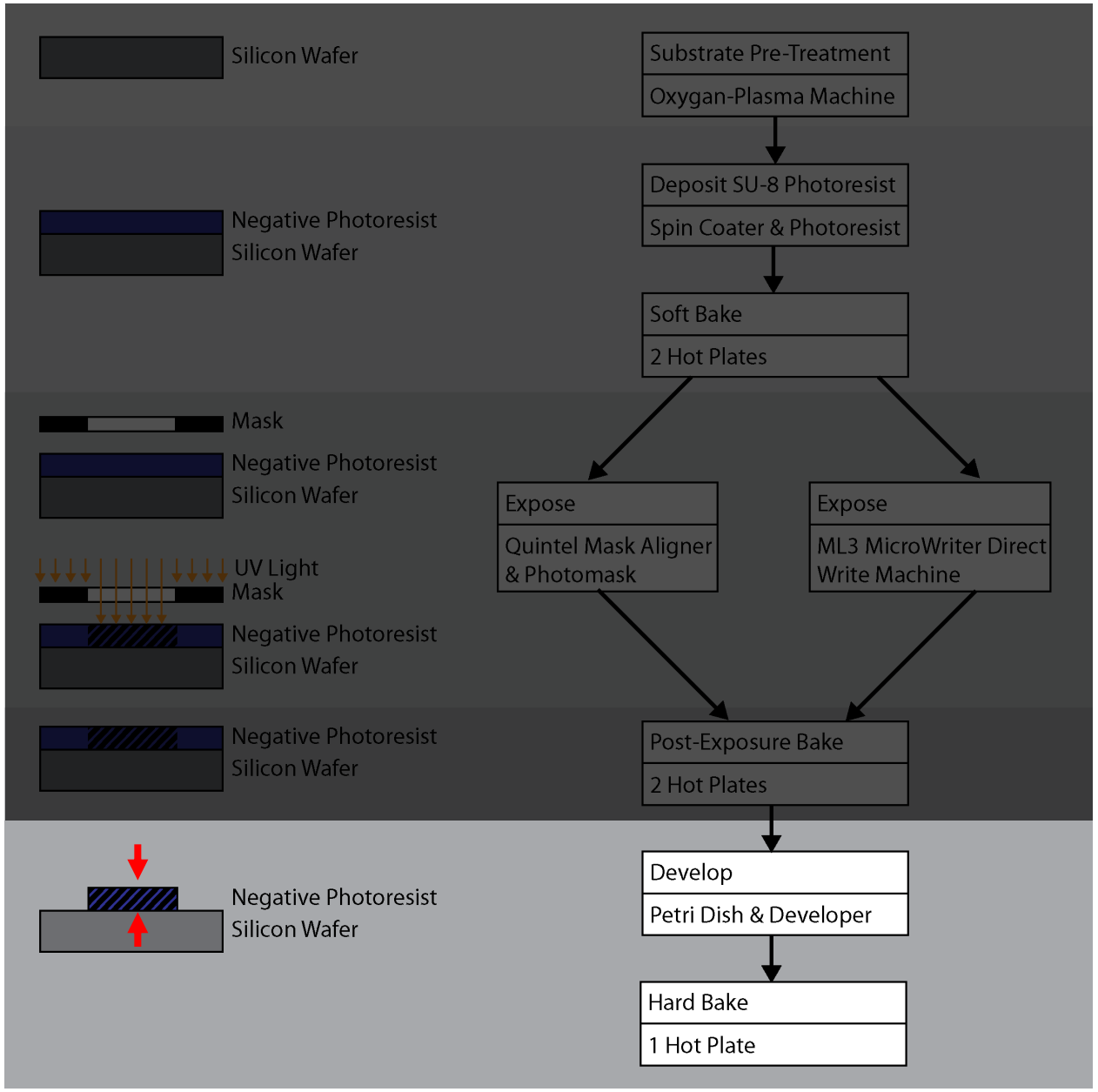
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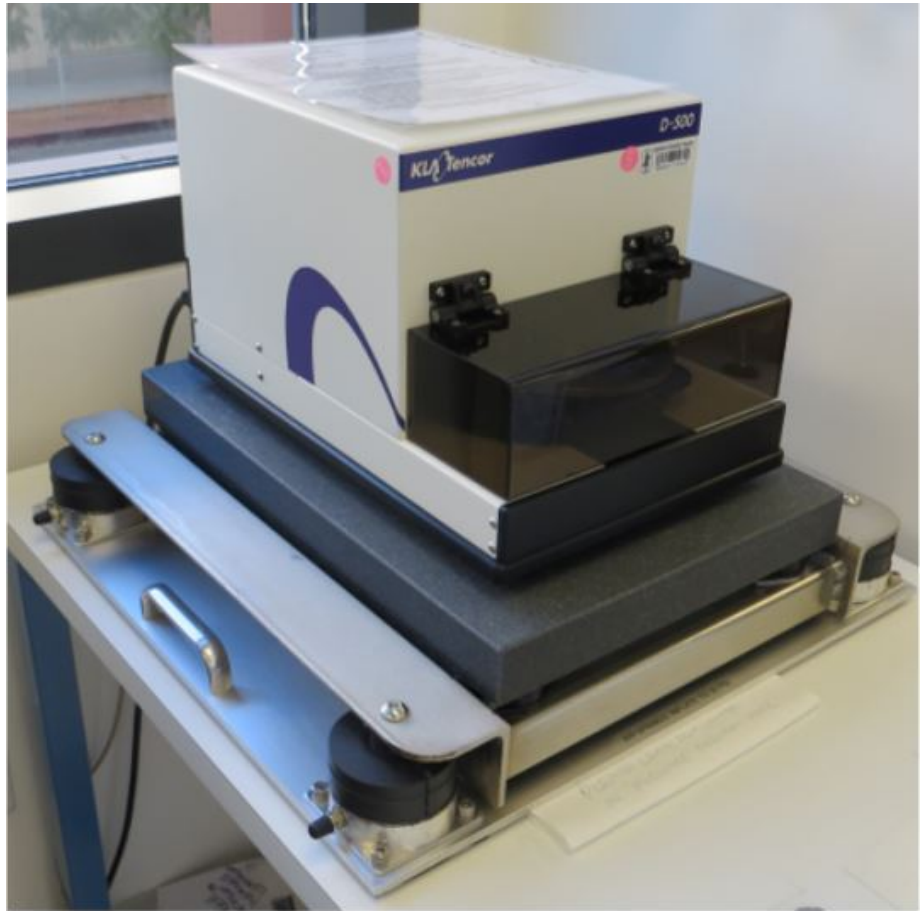
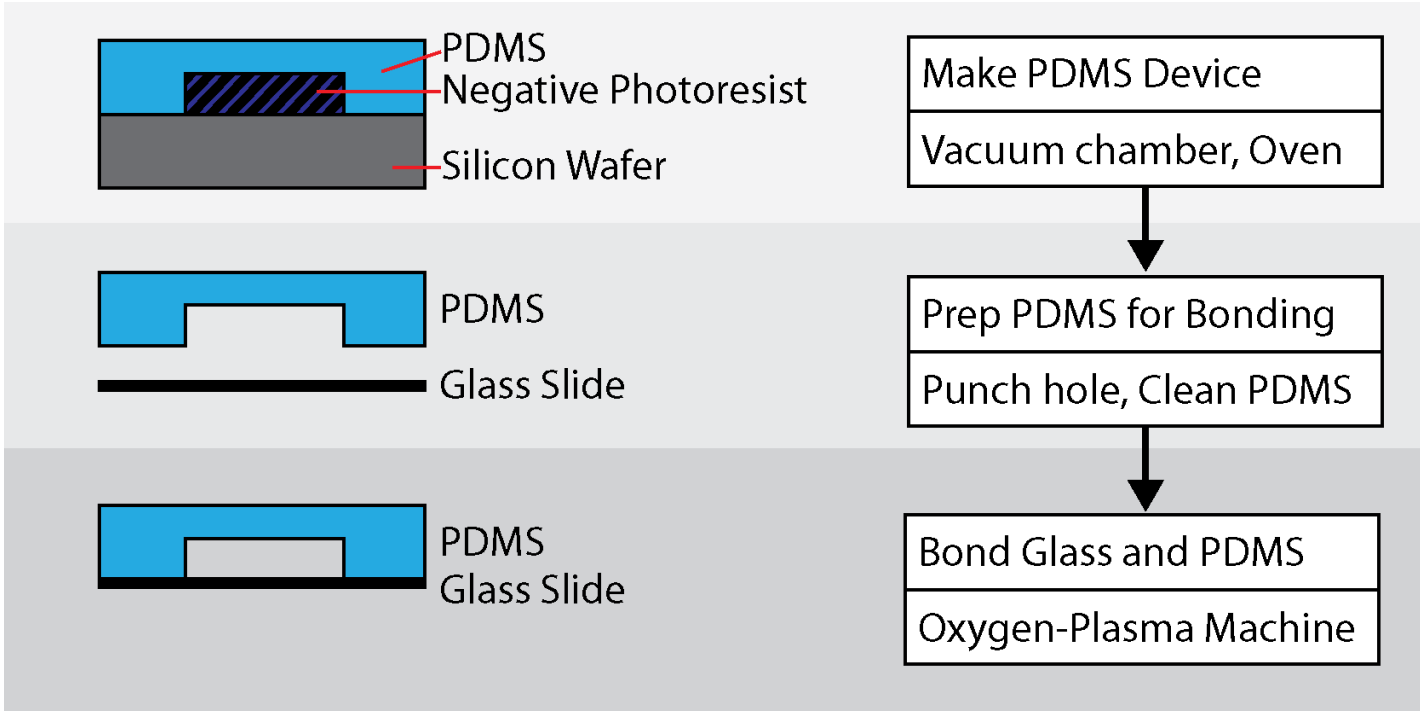
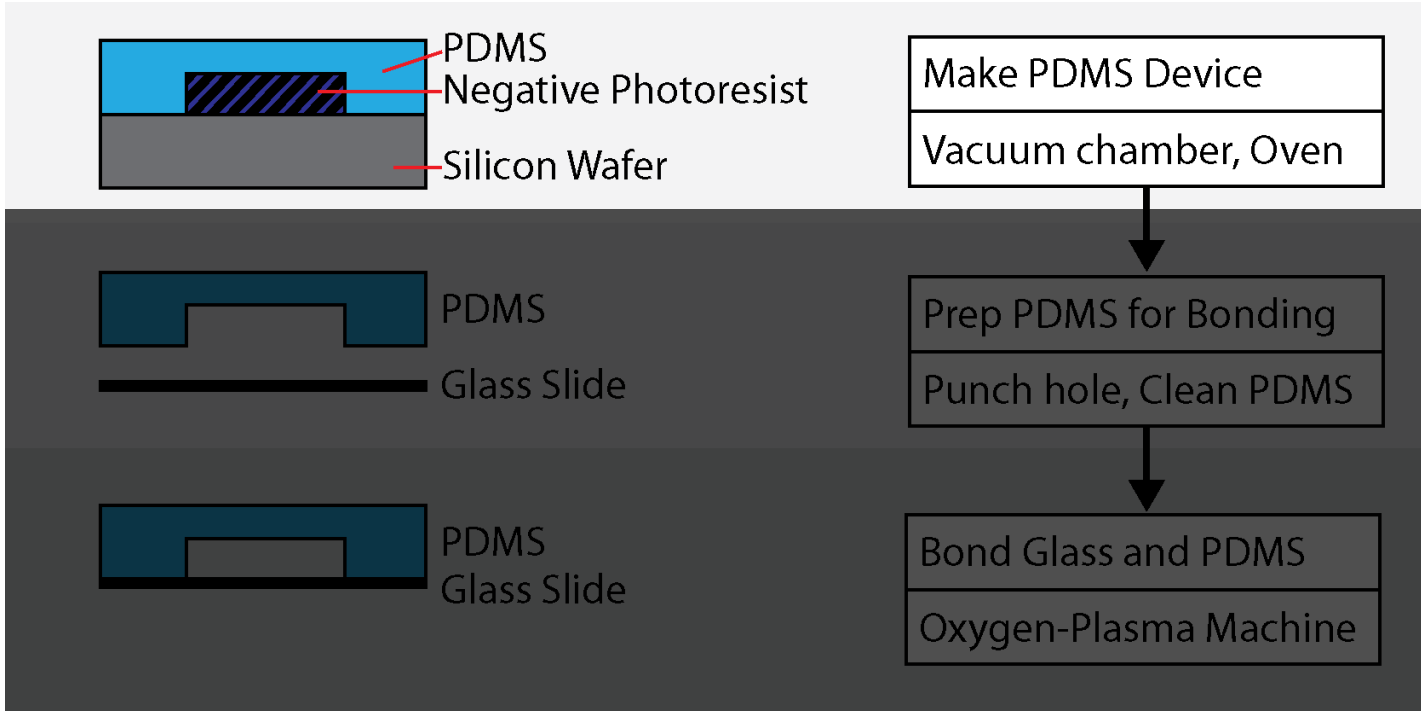

KLA Tencor
D-500

Part 2: Microfluidic Device Manufacturing



Part 2: Microfluidic Device Manufacturing



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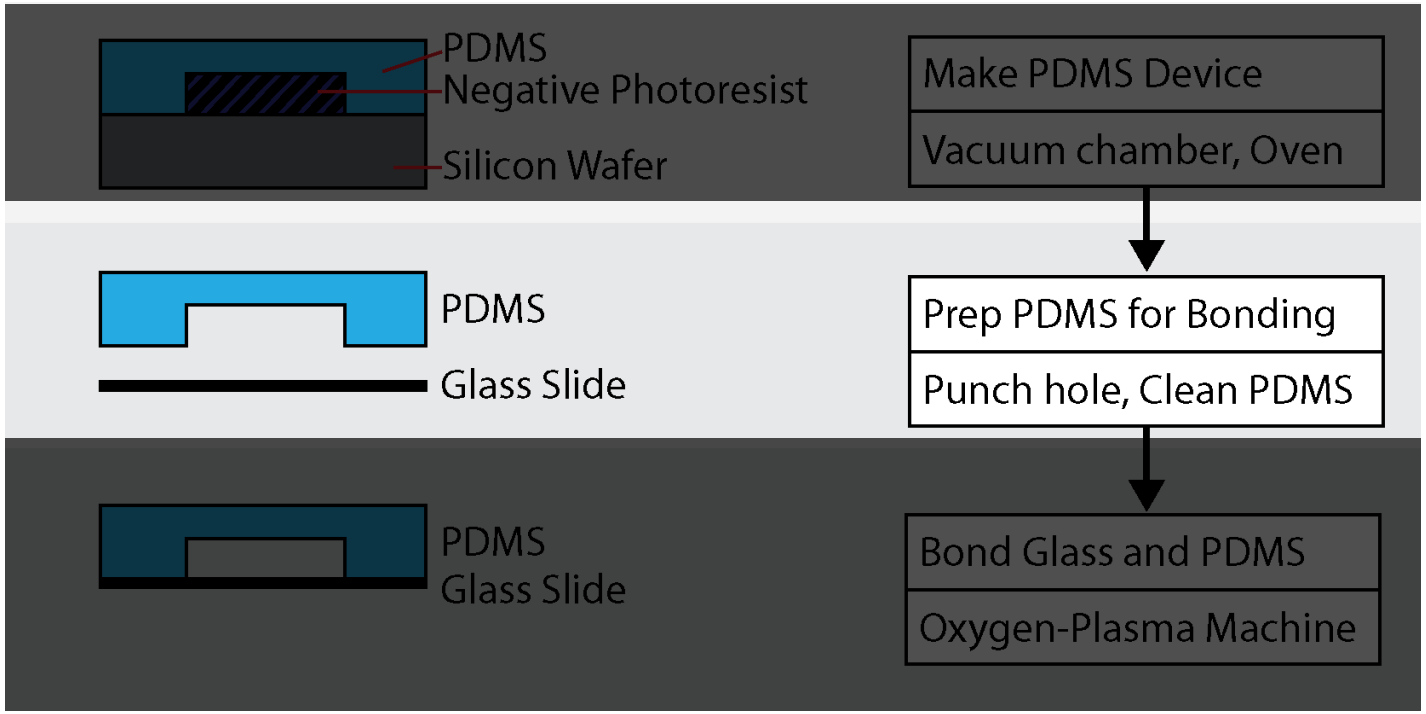

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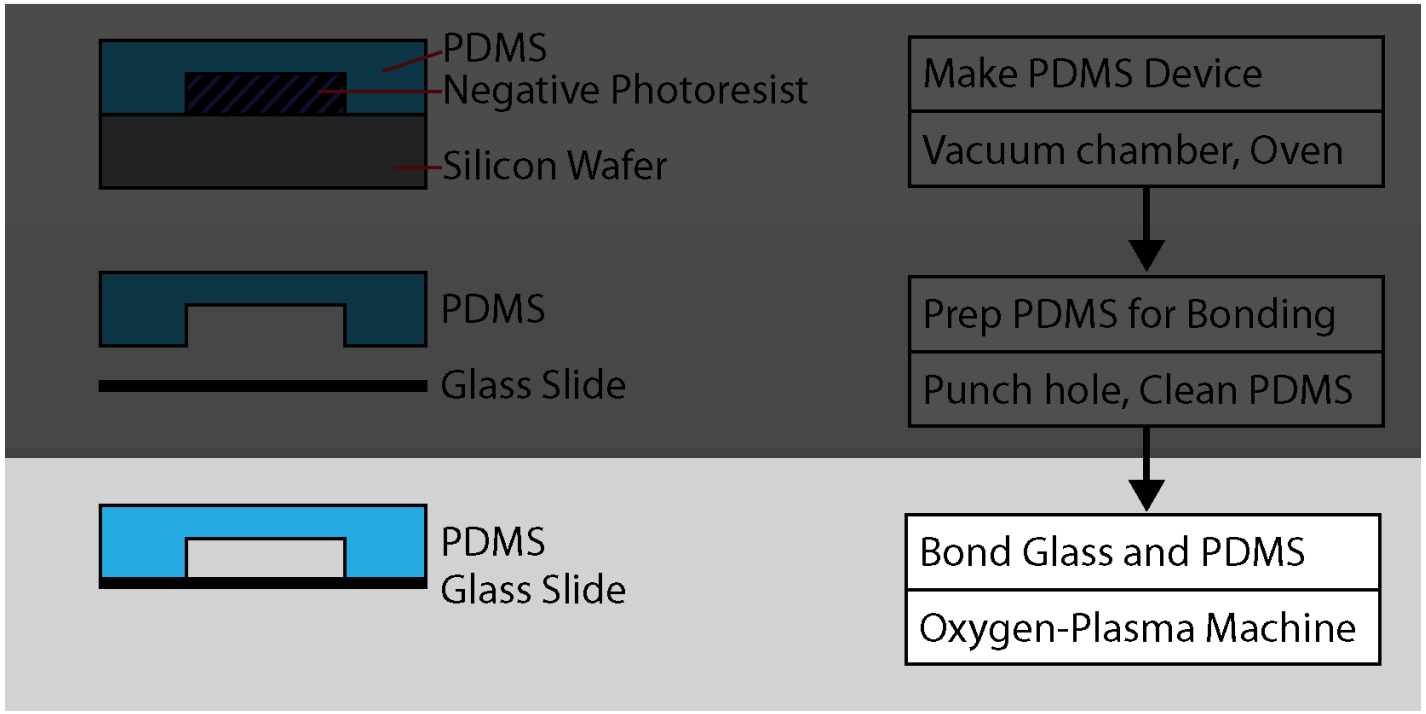
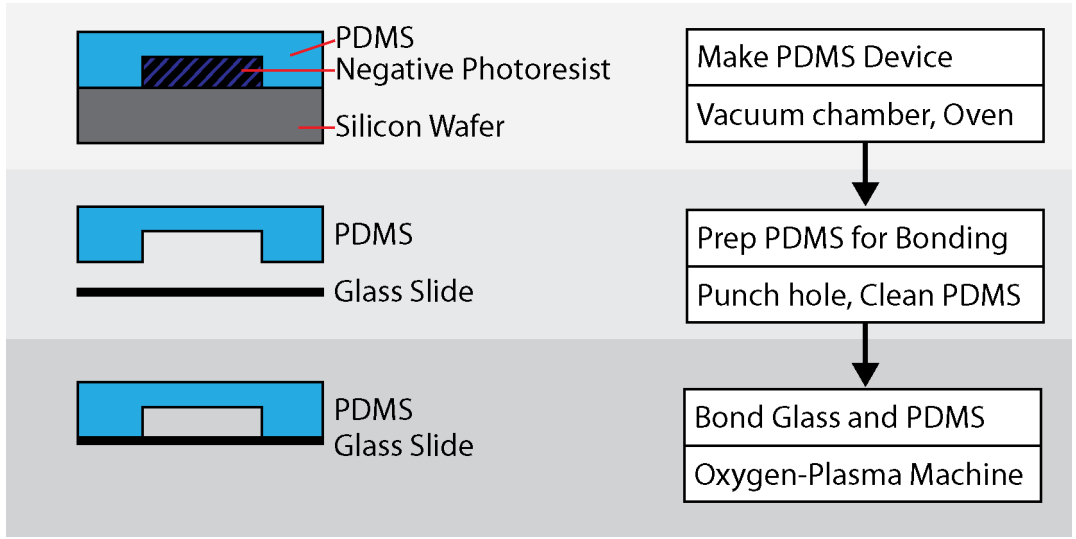
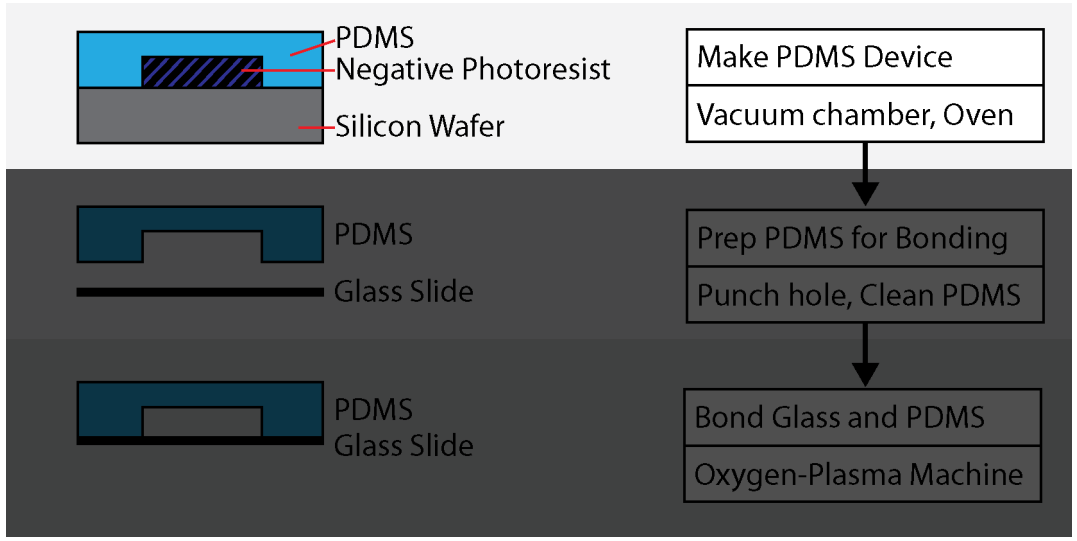



PDMS
Negative Photoresist
Silicon Wafer
Make PDMS Device
Vacuum chamber, Oven
PDMS
Glass Slide
Prep PDMS for Bonding
Punch hole, Clean PDMS
PDMS
Glass Slide
Bond Glass and PDMS
Oxygen-Plasma Machine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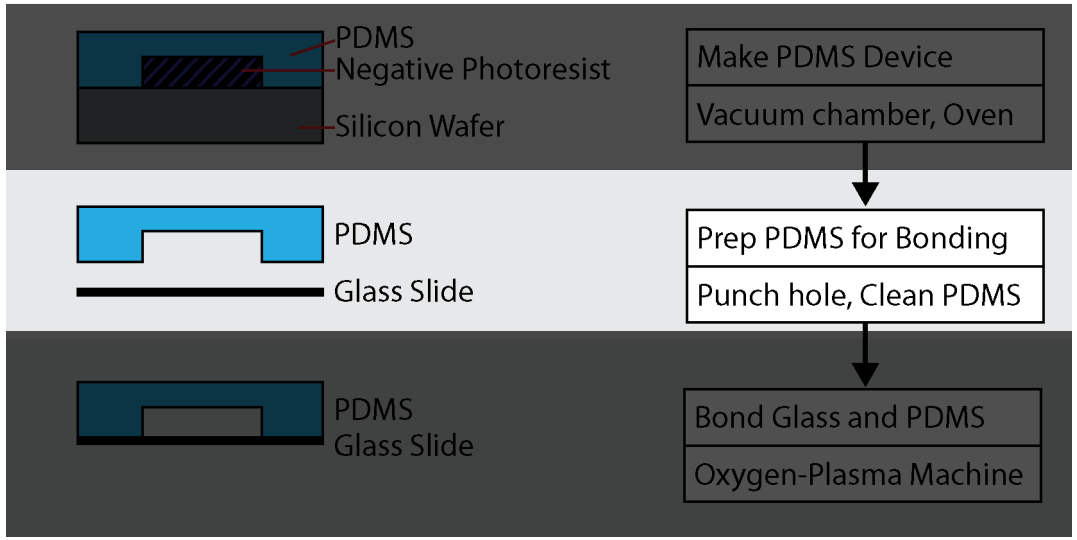
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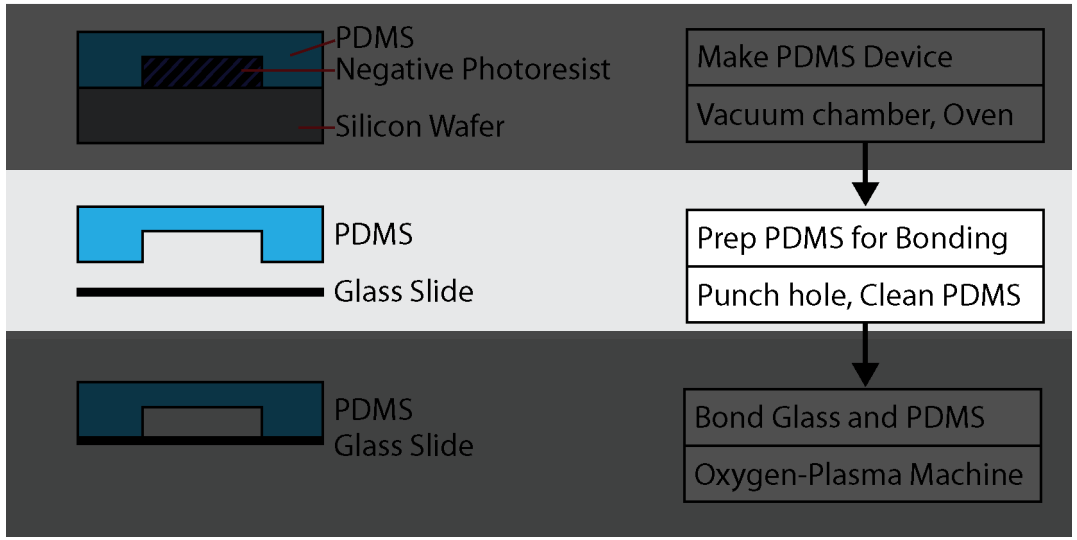
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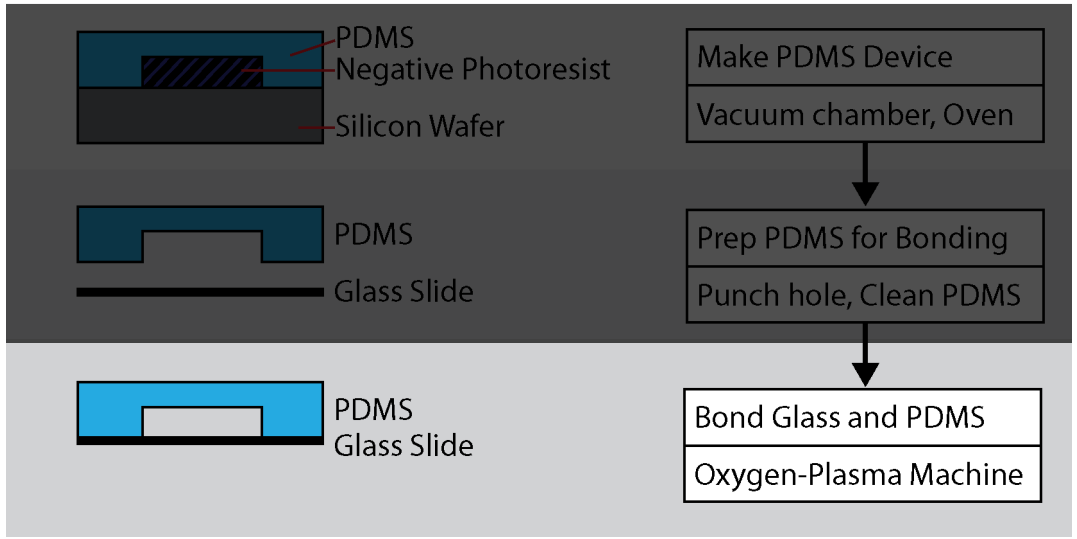
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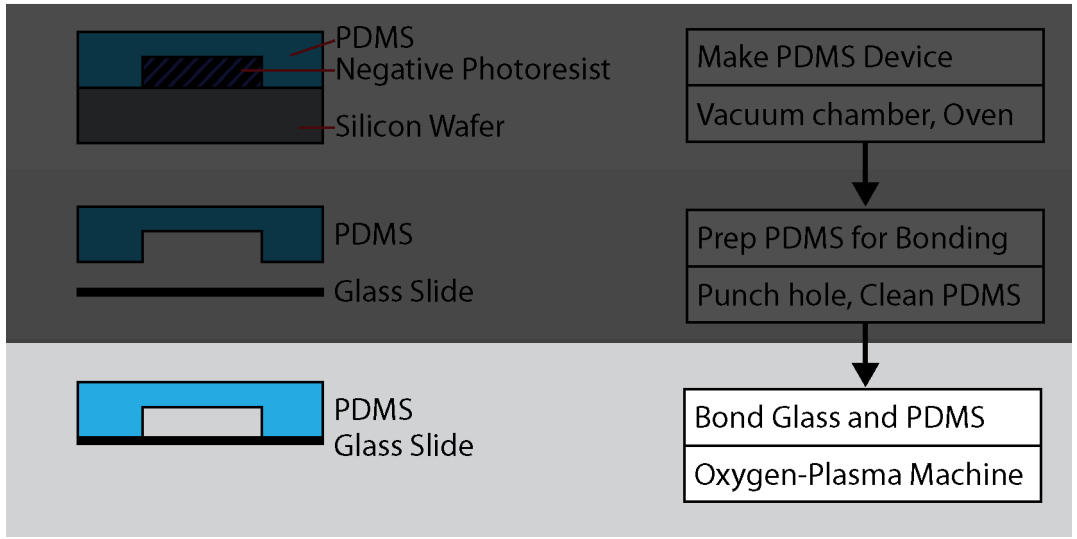
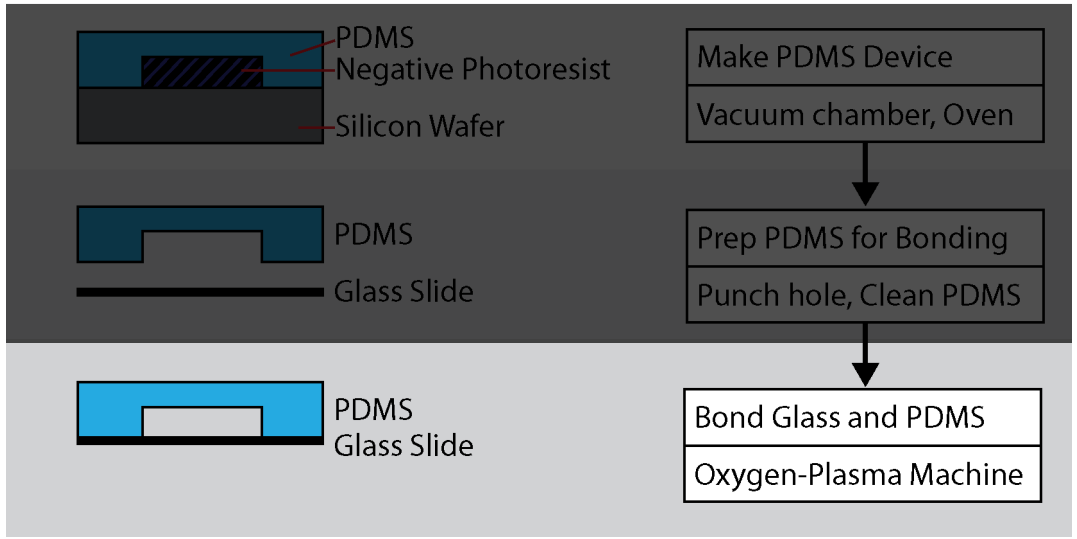
Bond Glass and PDMS
Oxygen-Plasma Machine


PDMS
Negative Photoresist
Silicon Wafer
Make PDMS Device
Vacuum chamber, Oven
PDMS
Glass Slide
Prep PDMS for Bonding
Punch hole, Clean PDMS
PDMS
Glass Slide
Bond Glass and PDMS
Oxygen-Plasma Machine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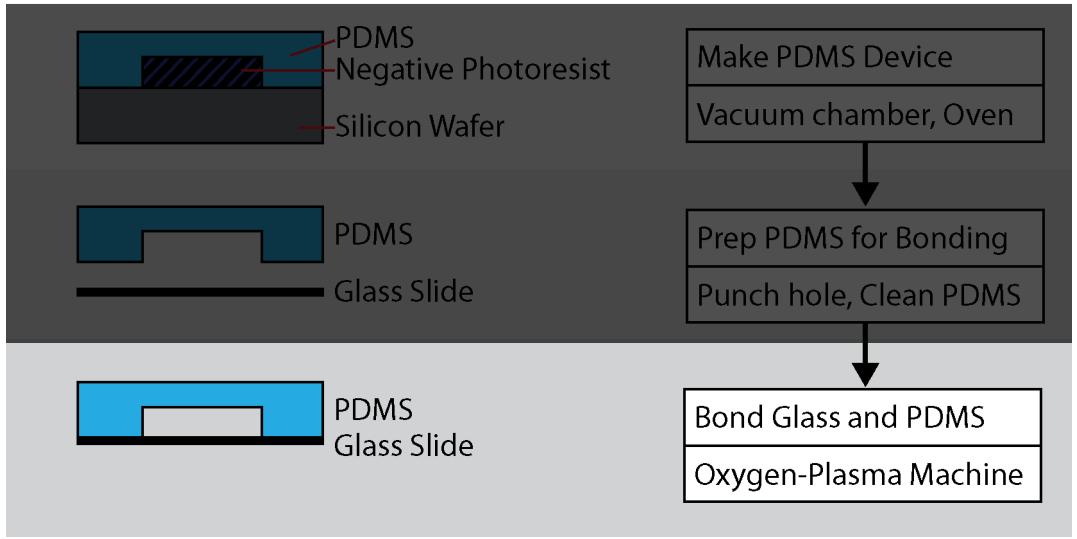
JUSTRITE
FLAMMABLE
INFLAMMABLE
INFLAMMABLE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