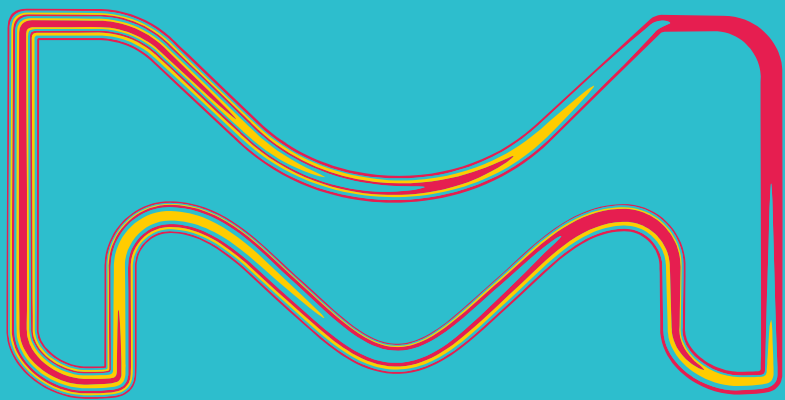




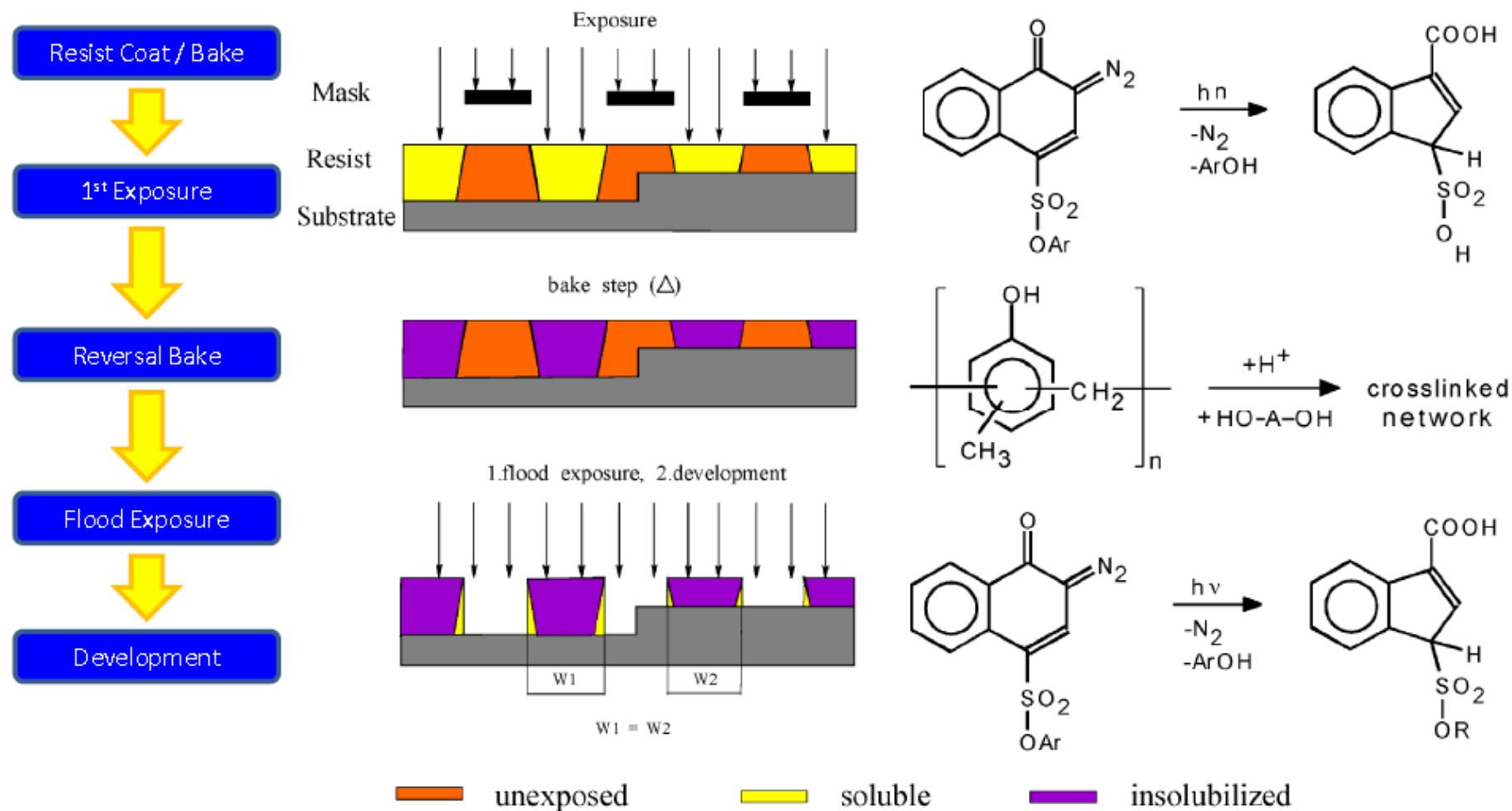
Datapackage of AZ 5214E

Merck Electronics, Semiconductor solutions

10/2021

MERCK

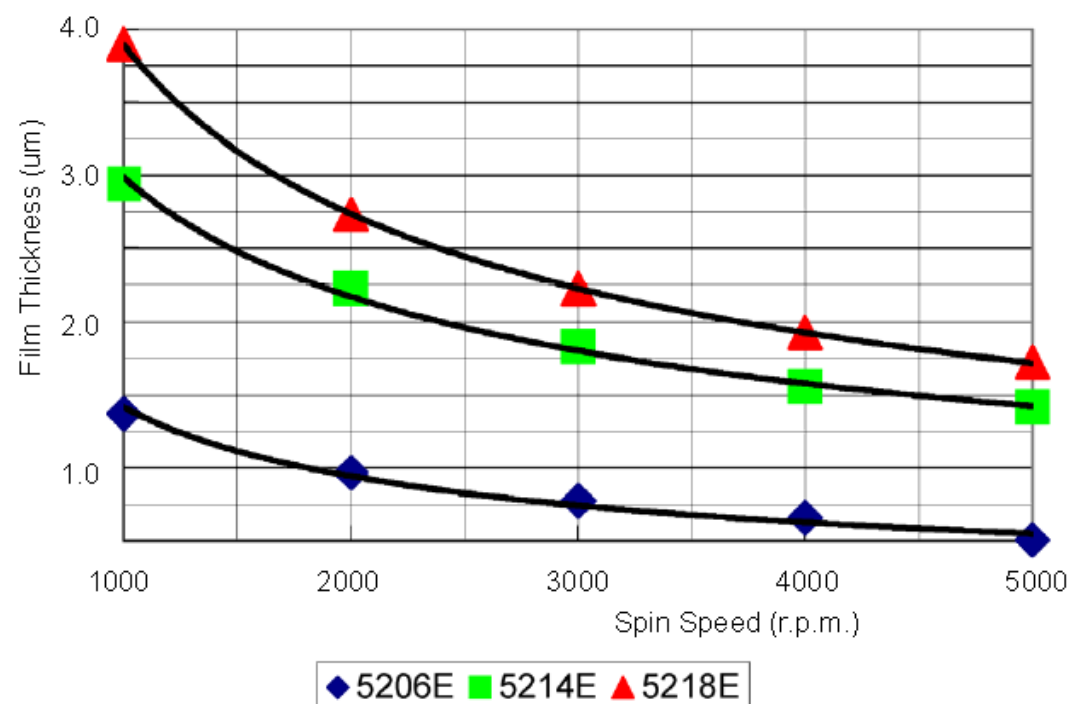
Process Scheme for Acid-Catalyzed Image Reversal



Spin Curve

- ◆ AZ® 5200-E series have three kinds of viscosity version.
- ◆ AZ® 5200-E series cover 4 ~ below 1um film thickness with orthodox single coating.

Product Name	Viscosity
AZ® 5206-E	7cP
AZ® 5214-E	25cP
AZ® 5218-E	44cP



Substrate : 6inch Bare Si

Soft bake : 90degC / 90sec (Hot plate)

Optical Parameter

Description

AZ® 5200-E series is the only one resist, 'Image Reversal type resist'

- *Reversed taper pattern can be made*
- *Cross-linking reaction with reversal bake process*
- *Easier stripping compared with negative-tone resists*

Material Parameters & Characteristics

Refractive Indices

	Bleached		Unbleached	
	n	k	n	k
365nm	1.6904	0.0012	1.6990	0.0175
405nm	1.6667	0.0005	1.6888	0.0179
435nm	1.6534	0.0004	1.6758	0.0040

Cauchy Constants

	Bleached	Unbleached
Thickness(nm)	1390.3	1414.7
A	1.5908	1.6035
B(um ²)	0.011525	0.0055741
C(um ⁴)	6.70x10 ⁻⁷	2.34x10 ⁻³

<<Formula>>

Reflective Index =N(ramuda)

$N(\text{ramuda})=A + B/(\text{ramuda})^2 + C/(\text{ramuda})^4$

At cumulate N(ramuda), it must the figure of (ramuda) equal to micron meter.

For examples, if you check Reflective Index at 365nm(Unbleached)

$N(0.365\mu\text{m})=n1 + n2/(\text{ramuda})^2 + n3/(\text{ramuda})^4$

$=1.6035+0.0055741/(0.365)^2+2.34*10^{-3}/(0.365)^4$

1.777

Process Data

Soft Bake (C/sec) 90/60

Post Exposure Bake(C/sec.) 90/60

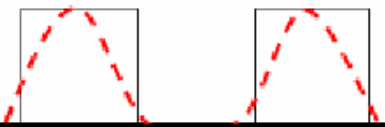
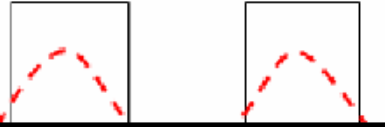
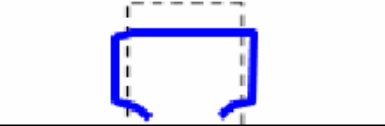
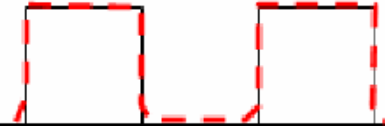
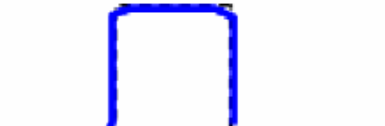
Developer AZ300MIF

Develop Temperature(C) 20

Resist Profile Dependency with Each of Process Parameters

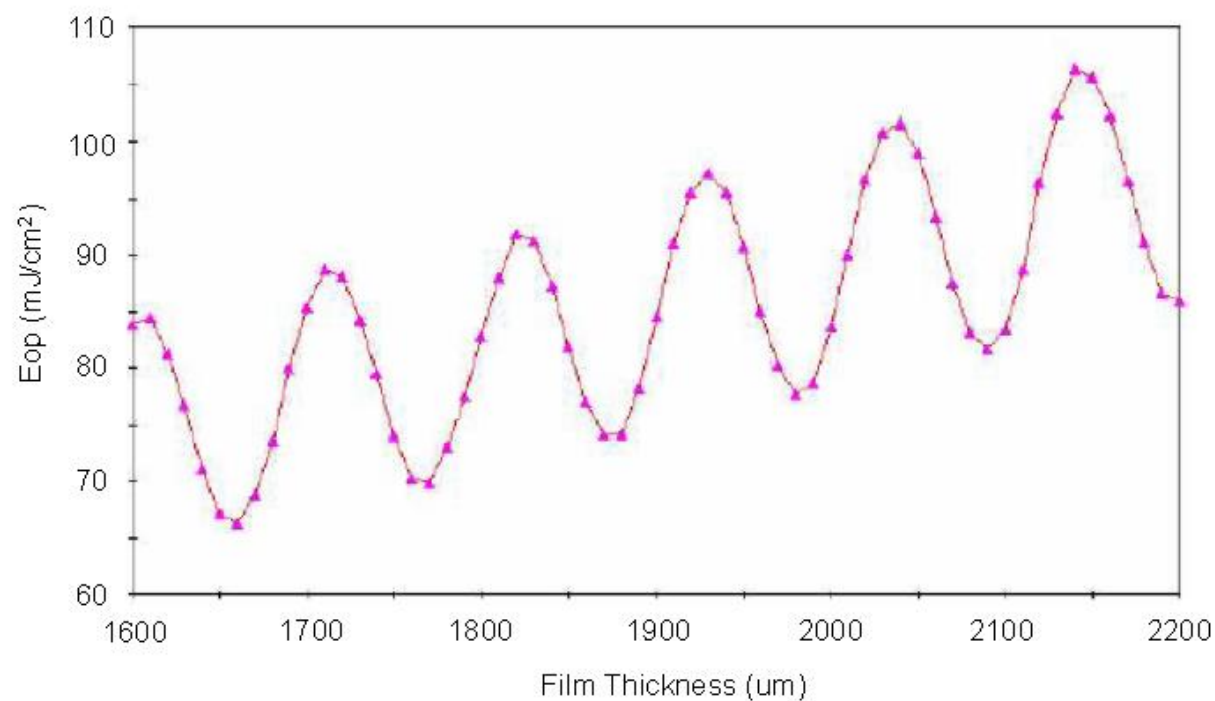
1st Exposure (Dose Energy)	Too High		Coming of Over-hanged shape & Occur large thickness loss at resist patterned area
	Too Low		Could not be making a pattern due to lack of cross-linkage chemical reactions
Reversal bake (Temperature)	Too High		A line pattern shift into wider size & Tend to happen a resist scrumming in bottom edged pattern
	Too Low		Coming of larger under-cutting shape & Not making a pattern due to lack of cross-linkage chemical reactions
Flood exposure (Dose Energy)	Too High		Coming of larger under-cutting shape & Lost the dissolution characteristic in alkaline solution
	Too Low		Tend to happen a resist scrumming in bottom edged pattern

Resist Profile Dependency with Applied Substrate Characters

High Reflection character Substrate		Lower Exposure Energy Area	Higher Exposure Energy Area
	Light intensity		
	Pattern profile		
Low Reflection character Substrate		Lower Exposure Energy Area	Higher Exposure Energy Area
	Light intensity		
	Pattern profile		

Swing Curve

Soft bake	:100degC/90sec (Hot plate)
Exposure	:Nikon i-line stepper (NA=0.54)
Development	:AZ 300MIF(2.38%) 60sec(Puddle)



Positive-tone Profile and Resolution@1.47um FT

Film thickness	:1.47um FT
Soft bake	:100degC/90sec (Hot plate)
Exposure	:i-line stepper (NA=0.50)
Development	:AZ 300MIF(2.38%) 60sec(Puddle)

Positive-tone Patterning

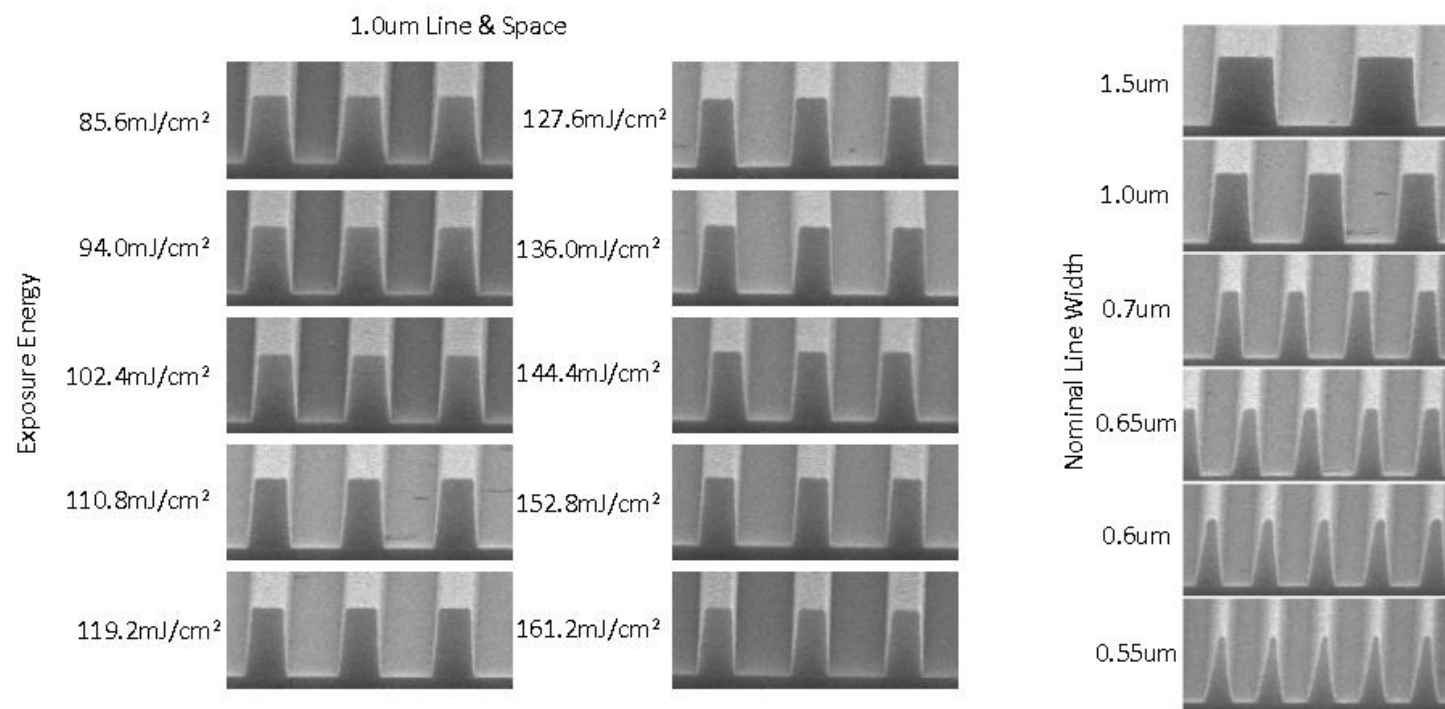


Image Reversal Profile and Resolution@1.47um FT

Film thickness	:1.47um FT
Soft bake	:100degC/90sec (Hot plate)
Exposure	:i-line stepper (NA=0.50)
Reversal bake	:115degC/120sec (Hot plate)
Flood exposure	:Mask aligner (g/h/i-line) 240mJ/cm ²
Development	:AZ 300MIF(2.38%) 60sec(Puddle)

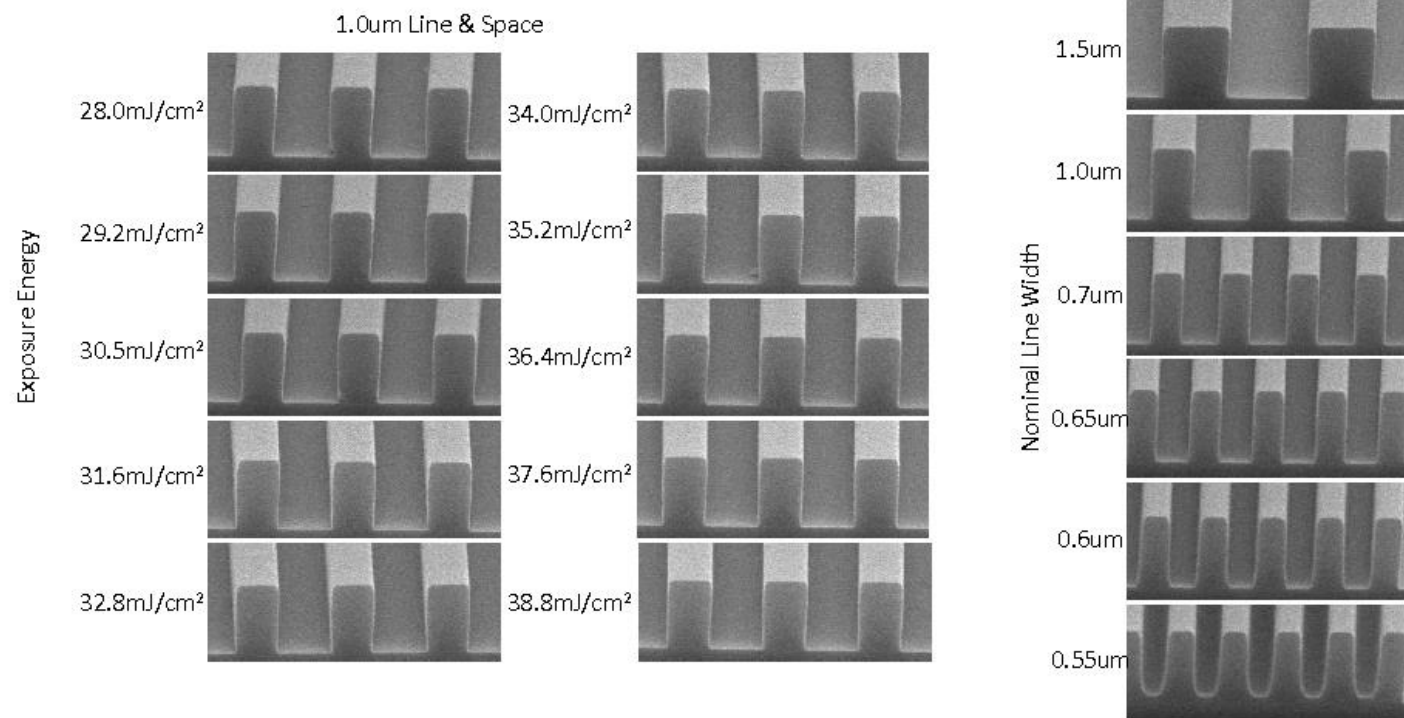


Image Reversal Profile and Resolution@3um FT, flood dose 189mJ/cm²

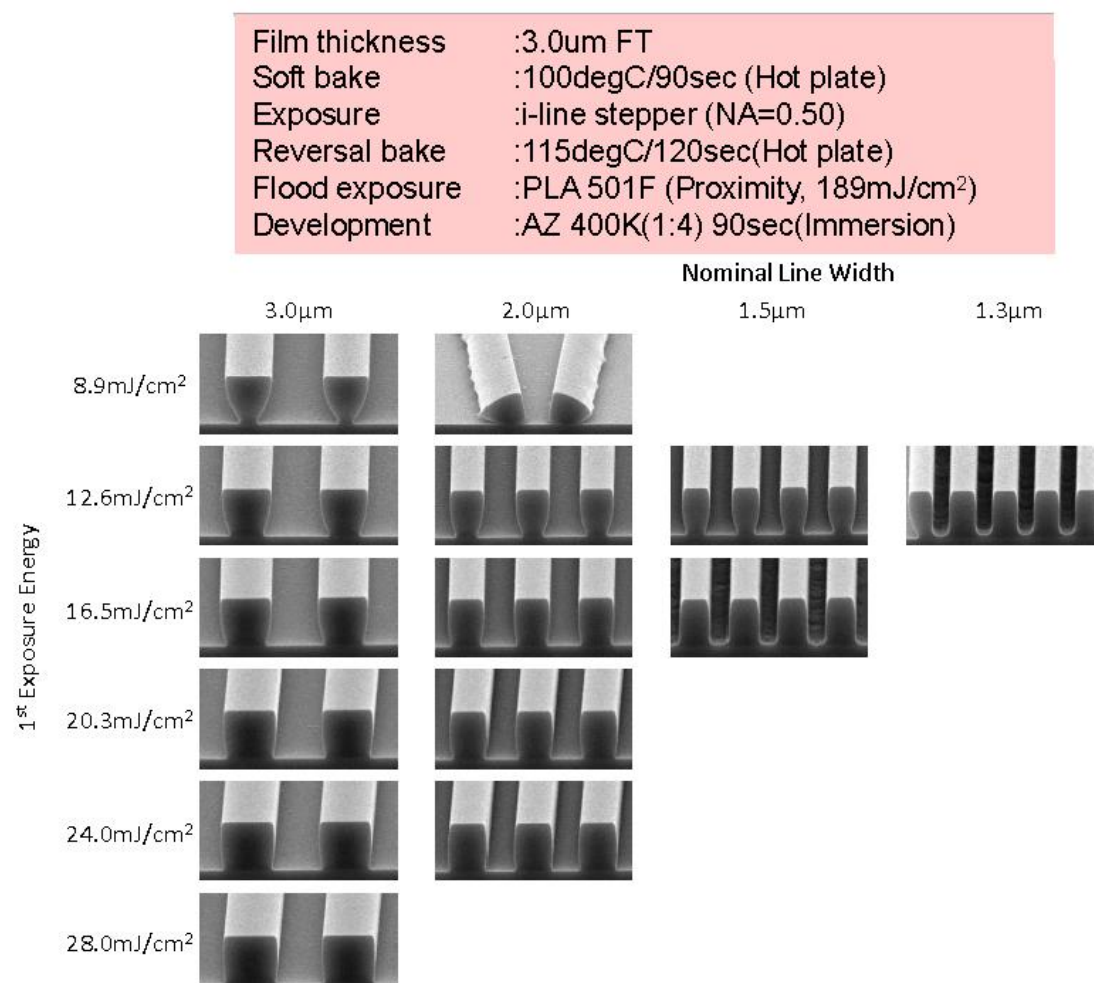


Image Reversal Profile and Resolution@3um FT, flood dose 252mJ/cm²

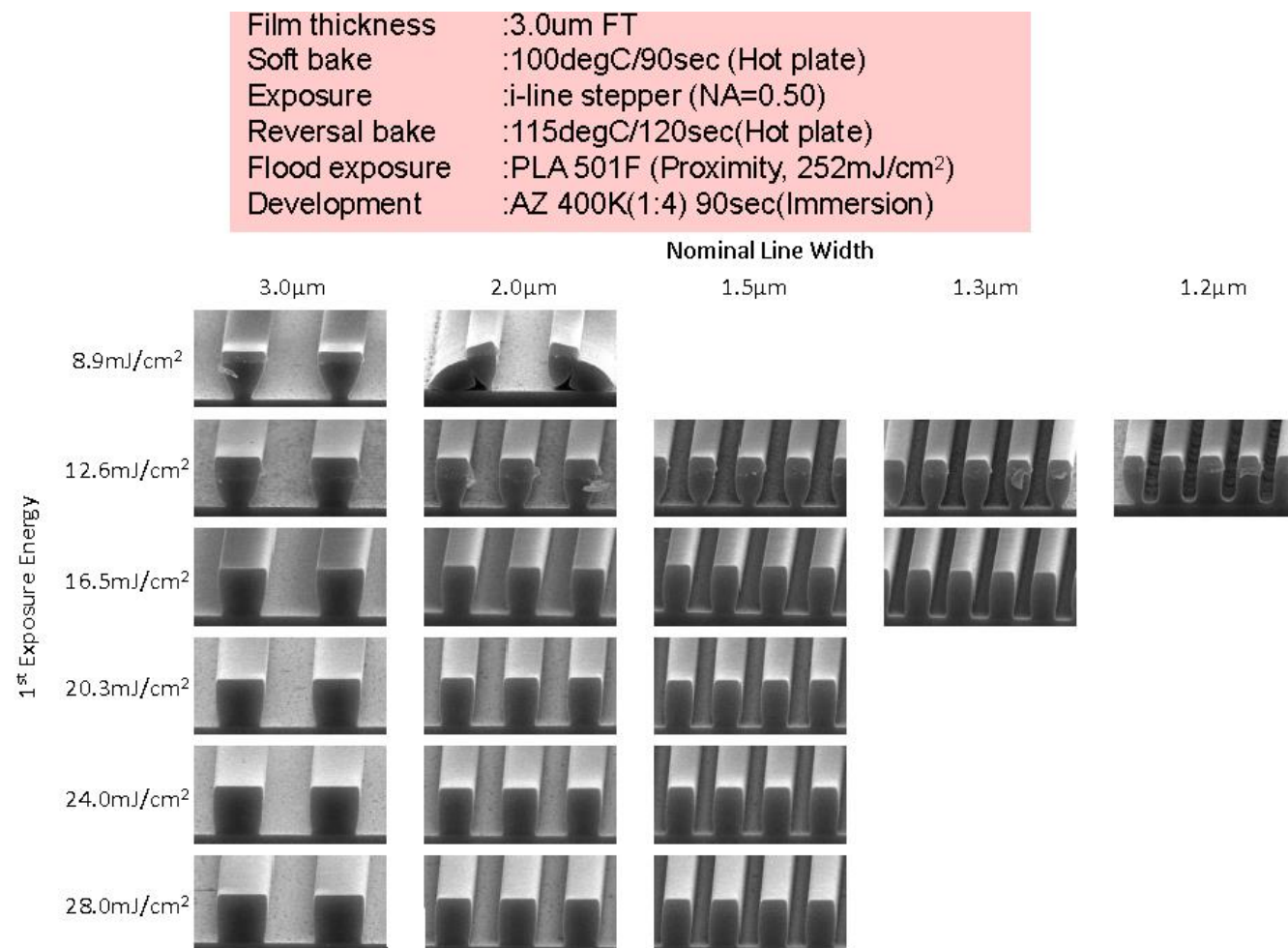


Image Reversal Profile and Resolution@3um FT, flood dose 315mJ/cm2

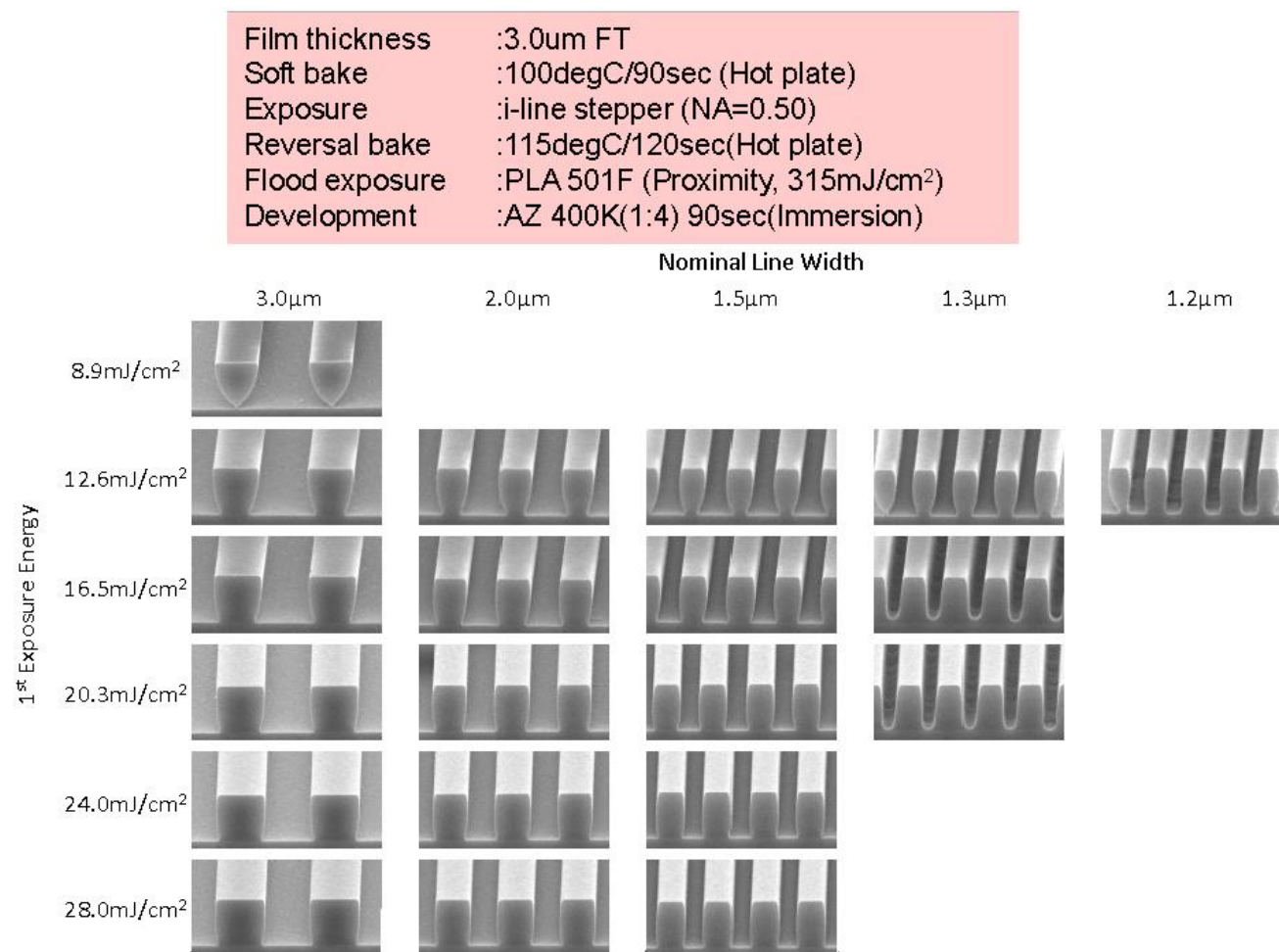


Image Reversal Profile and Resolution@3um FT, flood dose 189mJ/cm², Reveal Bake 120C

Film thickness :3.0um FT
Soft bake :100degC/90sec (Hot plate)
Exposure :i-line stepper (NA=0.50)
Reversal bake :120degC/120sec(Hot plate)
Flood exposure :PLA 501F (Proximity, 189mJ/cm²)
Development :AZ 400K(1:4) 90sec(Immersion)

