

AZ nLOF5510-Photoresist Photolithography Process using UCSB GCA6600 Wafer Stepper

Purpose: Characterize AZnLOF5510 photoresist photolithography process with the variation of exposure time and focus offset using stepper mask aligner. 0.5um dense lines/spaces are possible over a good range of exposure and focus. This resist would be good for high resolution, sub-0.5um thickness lift-off. The resist is not Acetone soluble once imaged. Use 1165 stripper heated to 80C to remove or perform lift-off.

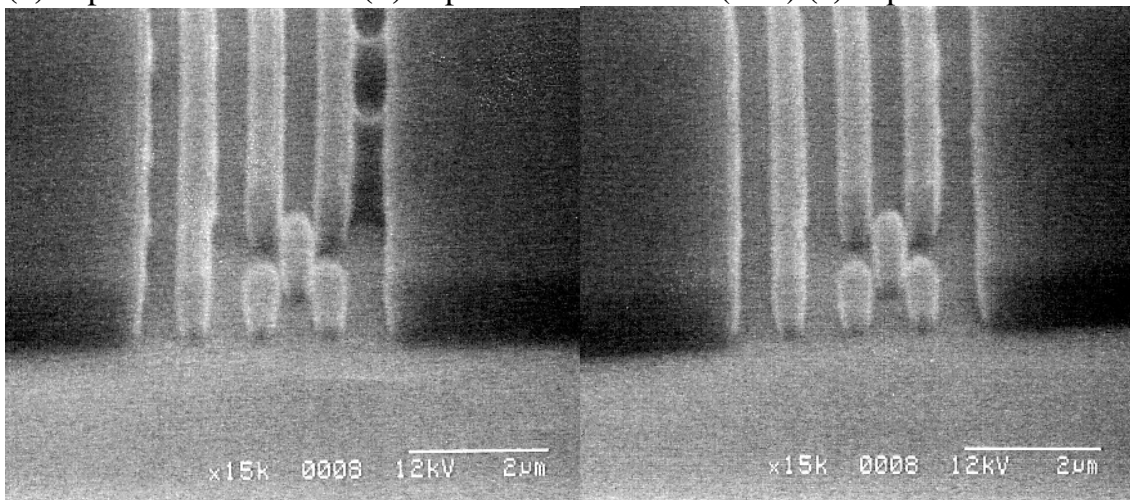
Procedure:

- Wafer (4-inch Si wafer) solvent (acetone: 2 minutes; methanol: 1 minute) clean, DI water resin, and N₂ blow dry.
- Wafer dehydration at a hot-plate temperature of 110 °C for 5 minutes.
- Spin-on HMDS at 4000 rpm for 30s.
- Spin-on AZnLOF5510 photoresist at 3000 rpm for 30 s.
- Soft bake at a hot-plate temperature of 90 °C for 60 s.
- Expose the resist using the stepper mask aligner: 10×10 dice with the exposure time ranging from 0.7 to 0.88 s; the focus offset ranging from -18 to 0
- Post-exposure bake at a hot-plate temperature of 110 °C for 60 s.
- Develop the exposed resist using AZ300MIF developer for 60 s.

Results and Discussions:

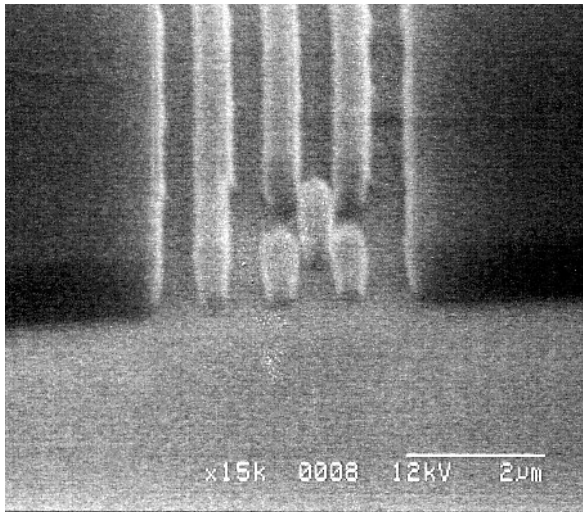
1) Exposure Time Variation

Figure 1. SEMs of dense 0.5um lines/spaces. Focus Offset is -6 for all exposures (a) exposure time=0.70 s (b) exposure time=0.74 s (best) (c) exposure time=0.78 s



(a)

(b)

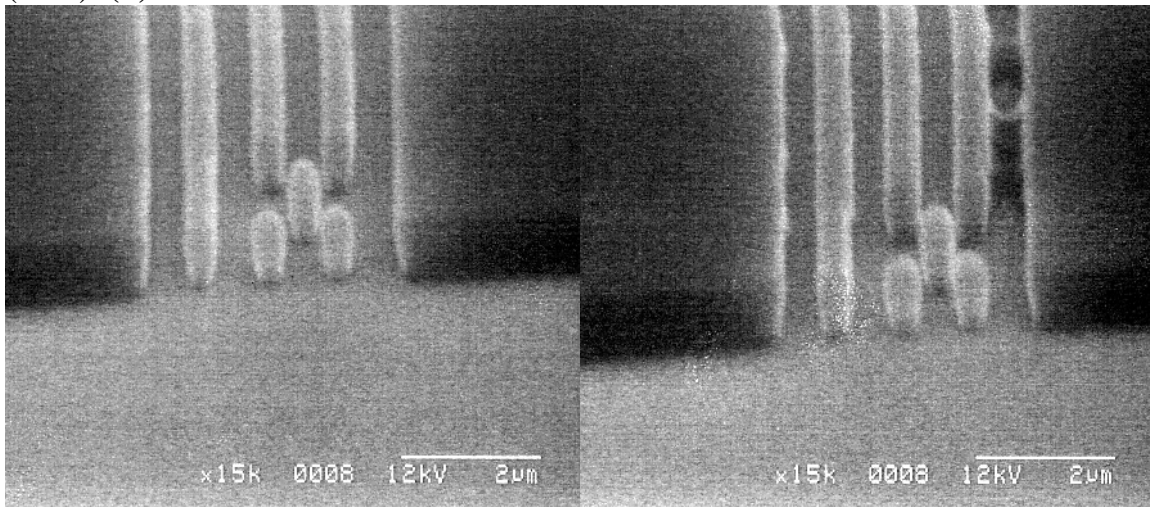


(c)

Note: The resist thickness is $\sim 0.93 \mu\text{m}$. For this exposure variation, the sidewalls are all slightly tapered inward (Good for Lift-off) and the linewidth is well controlled.

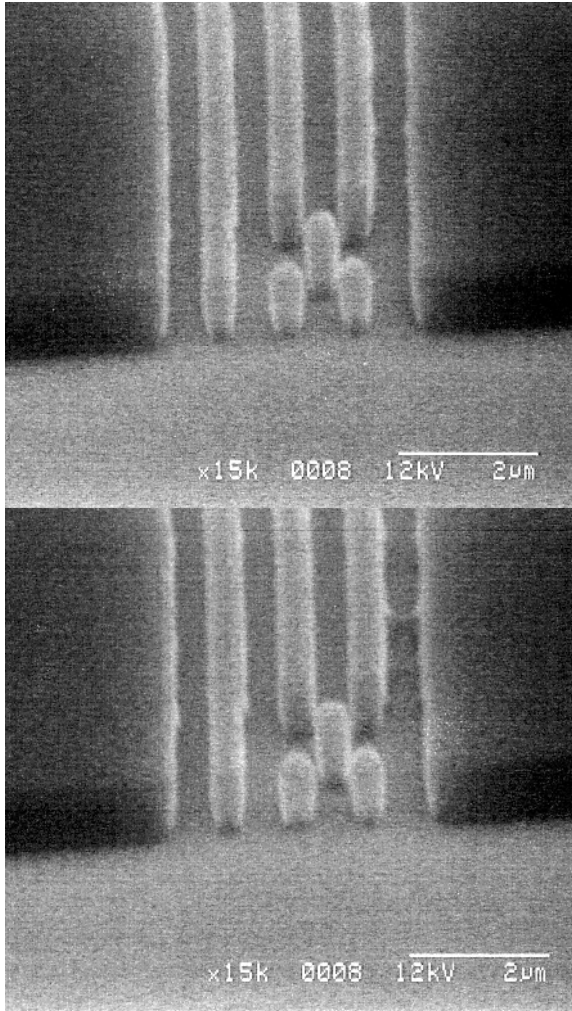
2) Focus Variation

Figure 2. . SEMs of dense 0.5um lines/spaces. Exposure is 0.74" for all exposures (a) Focus Offset = -14 (b) Focus Offset = -10 (c) Focus Offset = -6 (Best). (d) Focus Offset = --2



(a)

(b)



(c)

(d)

Note: The resist thickness is $\sim 0.93 \mu\text{m}$. For this Focus variation, the sidewalls are all slightly tapered inward (Good for Lift-off) and the linewidth is well controlled down to -10 on focus. For larger negative focus offsets, the linewidth of the space increases.