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
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 0.5\textmu m 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.
Note: The resist thickness is ~0.93 μm. 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.