Experiment 2-Y

Objective: To observe and learn the process of Lithography in the laboratory

Theory: Lithography is a fundamental technique in microfabrication used to create intricate patterns on a substrate. Laser writer lithography is a maskless form of lithography where patterns are directly written onto a photoresist-coated surface using a focused laser beam. This process eliminates the need for physical masks, allowing for rapid prototyping and custom designs with high resolution and flexibility.

In laser lithography, the substrate is first coated with a light-sensitive material called photoresist, which changes its chemical properties when exposed to the laser. Positive photoresists become more soluble in a developer when exposed to the laser, allowing the exposed regions to be removed during development. Conversely, negative photoresists become less soluble upon exposure, so the unexposed regions are washed away during development.

Materials:

1. **Positive or negative photoresist** (e.g., Shipley S1813)
2. **Substrate** (e.g., Silicon wafer, glass)
3. **Laser writer lithography system**
4. **Developer solution** (e.g., MF-319 for positive resist)
5. **Spin coater** (for coating photoresist)
6. **Acetone, IPA (Isopropyl Alcohol) for cleaning**
7. **Hotplate**
8. **Nitrile gloves**
9. **Tweezers**
10. **Nitrogen gas blower or air gun**

Procedure:

1. Clean the substrate with acetone or IPA and dry with nitrogen gas.
2. Spin coat the substrate with positive or negative photoresist.
3. Soft bake at 90°C for 60 secs to remove solvent.
4. Place the substrate in the laser writer lithography system.
5. Adjust laser power, focus, and exposure time for desired resolution.
6. Expose the photoresist to the laser to create the pattern.
7. Develop the exposed substrate in the developer solution for 30-60 seconds.
8. Rinse in deionized water and dry with nitrogen gas.

9. Hard bake at 120°C for 90 secs to stabilize the pattern.
10. Inspect the substrate under a microscope for defects and accuracy.

Observations:

Laser Power	Laser Exposer time	Laser spot size	Developing time	Pattern resolution	Hard bake temp.	Hard bake time

Result: