

Topic 6: Aluminum etch and contact angle measurement

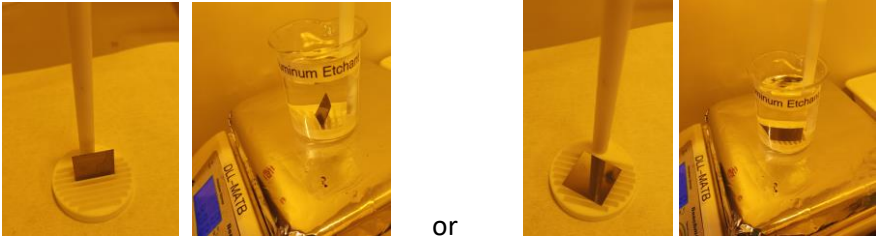


	1 st hour	2 nd hour
Pair 1	Angle contact measurement	Aluminum etching
Pair 2	Aluminum etching	Angle contact measurement

A photolithography system consists of various fundamental components, each contributing significantly to its operation.

1. The first key component is the photomask, which holds the pattern that is transferred to the wafer.
2. Next is the photoresist, a light-sensitive material applied to the surface of the semiconductor wafer that reacts chemically when exposed to light.
3. After exposure, a developer solution is used to remove parts of the photoresist that have been altered by light, exposing the pattern.
4. Finally, etching equipment is used to engrave the pattern onto the wafer surface.

Aluminum etching							
	Step #	Description	Equipment	Conditions		Remarks	
Mask preparation	1	Dehydrate Wafers	Hot Plate	160°C for 5 min			
	3	Spin on AZ1512	Spinner	Step	Speed (rpm)	Time (s)	
				1	700	10	
		2	4000	60			
	4	Soft Bake	Hot Plate	100°C for 60 sec			
	5	Exposure	UV light	20 s		Hard Contact	
	6	Develop	Hood	AZ 726 MIF; 40 s		Agitate gently	
	7	Rinse in DI H ₂ O	Hood				
	8	Dry with N ₂	Hood				
9	Post-bake	Hood	100°C for 90 sec Post-baking is necessary in order to stabilize and harden the undeveloped photoresist prior to the etching process that the resist will mask.				
	10	Optical microscope inspection	Inspect wafer and take image of a specific pattern				

Aluminum etching	11	Eching solution	Hood	Aluminium etchant A: Mixing of Acid Acetic, acide nitric and acide phosphoric (ANP) (16:1:1:2 phosphoric, nitric, acetic, DI water) The solution is already in a beaker labelled "Aluminum Etchant A" on the hot plate at 40°C.
		DI Water rinse	Hood	2 beakers labelled « DI water #».
		Sample dry	hood	N2 gun.
	12	<ol style="list-style-type: none"> Put on nitrile gloves. Put on the neoprene gloves. 		
Operational Procedures	13	<ul style="list-style-type: none"> Put the sample onto the sample holder. Immerse the holder with the sample into the etchant, to etch your sample. Measure the etching time needed to completely remove the non-protected aluminum zones. When the etch is complete, transfer the sample carefully to the first DI water 1 rinse beaker and move the sample for 3 minutes in DI water. Transfer the sample to the DI Water 2 rinse beaker, and rinse for another 3 minutes while moving your sample. Blow dry the sample on a wipe in the bench. 		
				
	14	Optical microscope inspection	Inspect wafer and take image of the same pattern like in 10. If the aluminum is not completely etched you can etch the sample for more time and rinse	
	15	Resist stripping	hood	Strip off the photoresist in acetone and then rinse the samples in isopropyl alcohol and DI water.
	16	Optical microscope inspection	Take image of the same pattern like in 14. And compare the size of the Ptttern with and without resist.	

Angle contact measurement procedure

1	<p style="text-align: center;">Measurement Overview</p> <p style="text-align: center;">Tilting the stage can help align the baseline, however tilting too far can alter the measurement.</p> <p style="text-align: center;">A varying contact angle</p>	
2	<p>Objective</p> <p>The objective of this manipulation is to measure and compare the contact angle of a distilled water on silicon surface, prepared in three different ways, to understand the influence of cleanliness and surface functionalization on wettability</p>	
3	<p>1st sample</p>	<p>Measurement on silicon sample Without Cleaning</p> <ol style="list-style-type: none"> 1. Place the uncleaned sample on the sample holder, ensuring it is level. 2. Check the syringe is filled with distilled water. 3. With a micrometric screw, generate a drop 4. Gently, move the syringe needle close to the sample surface and let the droplet touches the sample surface. 5. Deposit a single drop of liquid onto the surface, then gently withdraw the needle without disturbing the drop. 6. Using the S-EYE 2.0 software, capture an image of the drop.

		7. Analyze the image to determine the contact angle. It is recommended to take the average of at least 3 measurements on different areas of the sample.									
4	2 nd sample	<p>Measurement on Surface Cleaned with Acetone and Rinsed with Water</p> <ol style="list-style-type: none"> 1. Cleaning: Vigorously wipe the sample with an acetone-soaked cloth to remove organic contaminants. 2. Rinsing: Immediately and thoroughly rinse the sample with distilled water to remove any acetone residue and soluble dirt. 3. Drying: Dry the surface using nitrogen air. 4. Proceed with the contact angle measurement as described with 1st sample. 									
5	3 rd sample	<p>Measurement on Silanized Surface via Spin Coating</p> <ol style="list-style-type: none"> 1. Take the same 2nd sample 2. Place the sample on the spin coater chuck. 3. Deposit a few drops of the HMDS solution in the center of the sample. 4. Start the spin coater program to spread the silane layer uniformly. <table border="1" data-bbox="708 1021 1206 1135"> <thead> <tr> <th>Step</th> <th>Speed (rpm)</th> <th>Time (s)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>700</td> <td>10</td> </tr> <tr> <td>2</td> <td>4000</td> <td>60</td> </tr> </tbody> </table> <ol style="list-style-type: none"> 5. Curing: baking may be required to fix the layer. <p>Proceed with the contact angle measurement as described before. The silanized surface should exhibit a high contact angle (hydrophobic)</p>	Step	Speed (rpm)	Time (s)	1	700	10	2	4000	60
Step	Speed (rpm)	Time (s)									
1	700	10									
2	4000	60									
6	Additional sample	Measurement on silicon sample covered with Teflon film.									
7	Results Analysis	Compare the contact angles obtained for the three samples.									