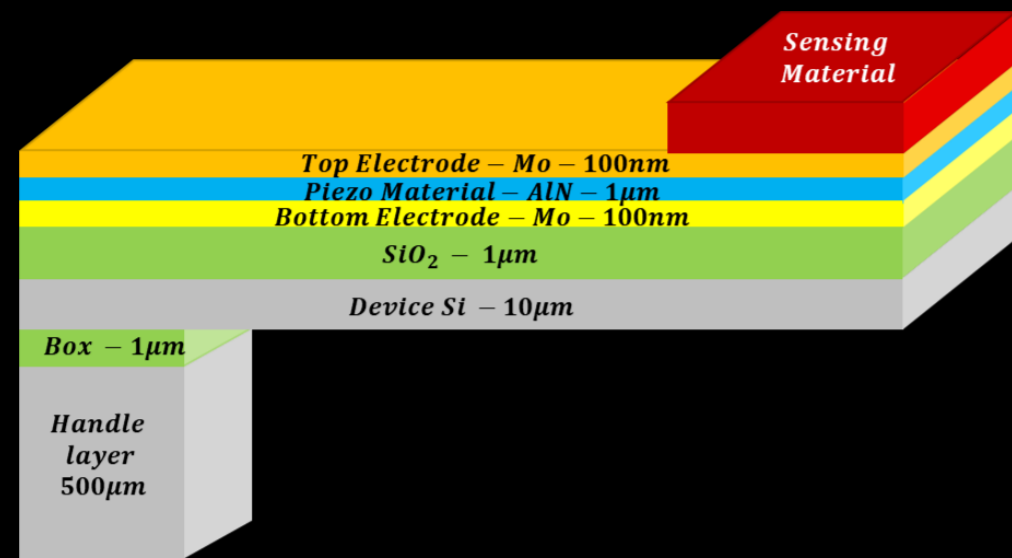
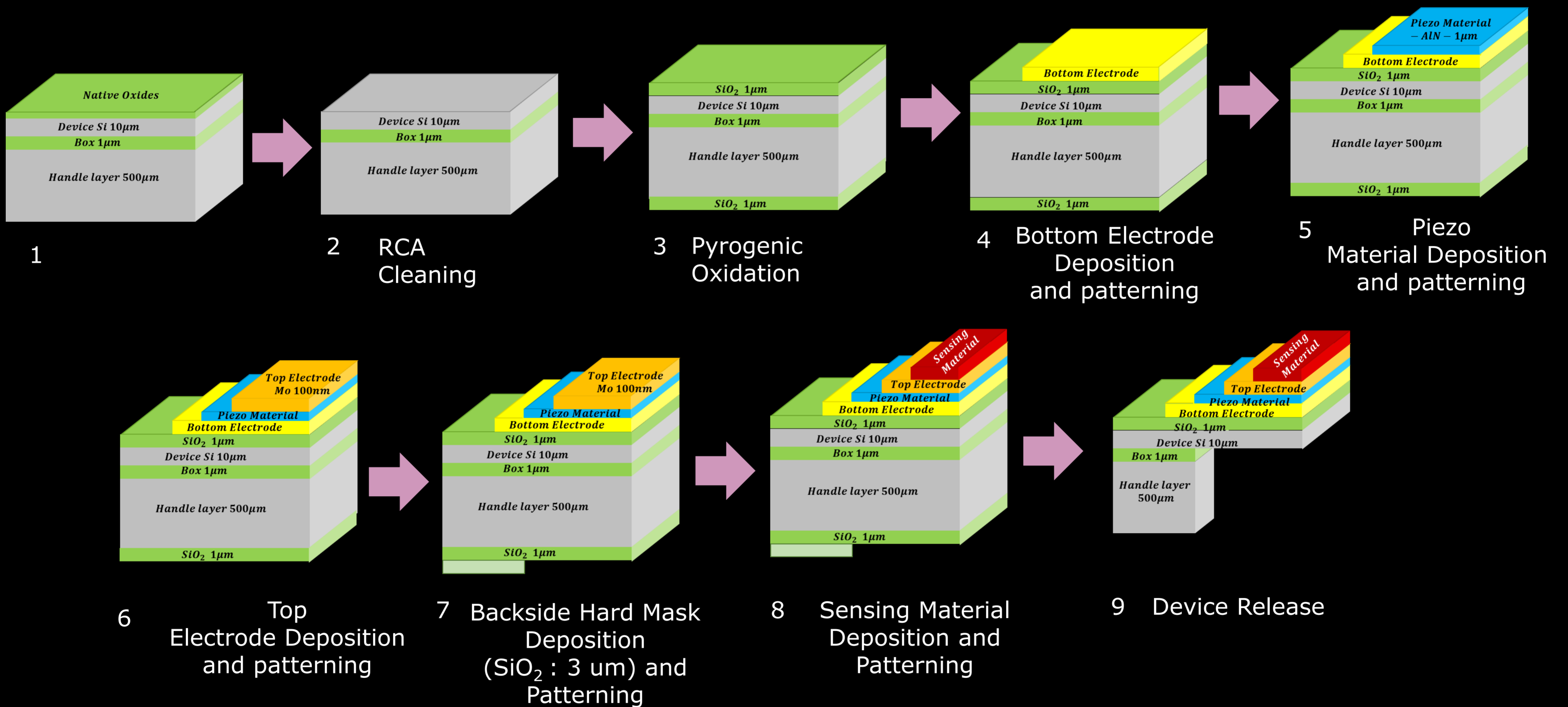


PIEZO MEMS PROCESS



Sl. No	Process name	Mask number	Critical dimension	Layer thickness	Comments
1	SOI substrate	-	-	>500µm	4" SOI DSP <100>
2	SiO ₂ oxidation	-	-	1µm	Pyrogenic oxidation
3	Bottom electrode deposition	-	-	100nm	Ti+Mo sputtering
4	Bottom electrode patterning	1	5µm	-	Lift-off
5	Piezo material deposition	-	-	1µm	AlN sputtering
6	Piezo material patterning	2	5µm	-	AlN dry etch
7	Top electrode deposition	-	-	100nm	Ti+Mo sputtering
8	Top electrode patterning	3	5µm	-	Lift-off
9	Sensing material dep	-	-	<200nm	20-200nm sputter
10	Sensing material pattern	4	5µm	-	Lift-off
11	Cantilever patterning	5	5µm	-	Device Si DRIE
12	Handle layer etch	6	100µm	-	Handle Si DRIE
13	Device release	-	-	1µm	RIE



Detailed Process Steps

Substrate: SOI device layer 10µm <100> DSP	Microscope and thickness inspection
Substrate cleaning: RCA	Sensing material deposition: Sputter <200nm
Passivation layer: Pyrogenic oxidation -SiO ₂ 1µm	Lift-off
Thickness inspection: Ellipsometer	Microscope and thickness inspection
Bottom electrode patterning: Layer 1	Cantilever patterning: Layer 5
Microscope and thickness inspection	Microscope and thickness inspection
Bottom electrode deposition: Sputtering - Ti+Mo - 10+100nm	Device layer Silicon etch: DRIE 10µm
Liftoff	Microscope inspection
Microscope and thickness inspection: Surface profiler	PR ash: Dry etch
Piezo layer deposition: Sputter - AlN 1µm	Microscope and thickness inspection
Piezo layer characterization on dummy: XRD, SEM, AFM	Backside hard mask deposition: PECVD SiO ₂ - 3µm
Piezo layer patterning: Layer 2	Thickness inspection - Ellipsometer
Thickness and microscope inspection	Backside hard mask patterning - Layer4
Piezo layer etch: dry etch	Microscope and thickness inspection
Microscope inspection	Backside hard mask etch: RIE
PR ash: dry etch	Microscope inspection
Microscope and thickness inspection	PR ash: RIE
Top electrode patterning: Layer 3	Microscope inspection
Microscope and thickness inspection	Device release: 1µm SiO ₂ BOX etch RIE
Top electrode deposition: Sputtering - Ti+Mo - 10+100nm	Microscope inspection under back illumination
Lift-off	Laser doppler vibrometry
Microscope, thickness and electrical inspection	Electrical characterization
Sensing material patterning: Layer 4	Sensor characterization
	Scanning electron microscopy