

## Equipment & price list, Hands-on-access fab., Micro System Integration Center, Tohoku University

Facility (CR, office) usage fee per person : TU user : 860 JPY/h, Others : 670 JPY/h

Technical assistant fee : 5,565 JPY/h (Nanotechnology Platform User : 3,150 JPY/h)

As of April, 2018

	No.	Equipment name	Manufacture/type	Fee (JPY/h)	Wafer size	Note
Cleaning, drying	A-1	Draft chamber	As one PSH1200	705	Max 6"	Cleaning by acids, wet etching (Si, SiO <sub>2</sub> , metal, etc.)
	A-2	Draft chamber for SiN etching		1,029	Max 6"	SiN wet etching
	A-4	Inert oven for sintering	Yamato DN63H	740	Max 6"	Al sintering in N <sub>2</sub>
	A-5	Vacuum oven	Yamato DP-31	649	Max 6"	Annealing in vacuum
	A-6	Brush scrubber	Zenkyo	3,922	Max 6"	Wafer cleaning after polishing
	A-7	Spin dryer	Toho Kasei ZAA-4	1,603	Max 6"	
	A-8	Draft Chamber for organic		705	Max 6"	
	A-9	4" Spin dryer	SEMITOOL PSC101	1,338	4"	cassette type
	A-10	6" Spin dryer	SEMITOOL PSC101	1,338	6"	cassette type
	Photolithography	B-1	Pattern generator	NSK TZ-310	1,524	Max 6"
B-2		Spin coater	Mikasa 1H-DXII	1,475	Max 4"	
B-3		Clean oven	Yamato DE62	1,861	Max 6"	Wafer bake
B-4		Curing oven	Yamato DN43H	1,247	Max 6"	Polyimide curing in N <sub>2</sub>
B-5		Double-side aligner	Suss MA6/BA6	2,369	Max 6"	Contact exposure, single/double side alignment, alignment for bonding
B-6		Single-side aligner	Canon PLA-501-FA	1,566	4"	Contact exposure, cassette type
B-7		Raith EB lithography	Raith 50	3,015	Max 3"	Max. 30keV, minimum resolution: 30nm
B-8		Draft chamber for development		705	Max 6"	
B-9		UV curing	Ushio UMA-802	2,585	4"	cassette type
B-10		Spin coater	Actes ASC-4000	1,629	Max 6"	
B-11		Spray developer	Actes ADE-3000S	1,379	Max 6"	Spray of developer and DI water
B-13		Elionix EB lithography	Elionix ELS-F125	6,869	Max 6"	Max. 130keV, minimum resolution: 4nm
B-14		Laser writer	Heidelberg Instruments DWL2000CE	6,570	Max 9"	405nm, min.L/S 0.7μm, photo mask making (Cr and emulsion), direct writing, gray scale lithography
B-15		Maskless exposure system for ball	Toei Scientific Industrial	3,750	Ball	Maskless lithography on ball (diameter:1.0,3.3mm), resolution:1.5μm half pitch, alignment precision: 5μm
B-16		Spin dryer	Toho Kasei ZAA-4	1,603	Max 6"	
B-17		Hot plate	Shamal HHP-230SQ	578	Max 8"	40-400 degree, Accuracy: 1 degree
Oxidation, diffusion, ion implantation, annealing		C-1	Oxidation (semiconductor)	TEL XL-7	8,851	Max 6"
	C-2	Oxidation (MEMS)	TEL XL-7	7,447	Max 6"	
	C-3	P diffusion	TEL XL-7	9,919	Max 6"	Pre-deposition
	C-4	P drive-in	TEL XL-7	8,243	Max 6"	
	C-5	B diffusion	TEL XL-7	8,955	Max 6"	Pre-deposition
	C-6	B drive-in	TEL XL-7	8,243	Max 6"	
	C-7	Annealing	TEL XL-7	8,225	Max 6"	Annealing after ion implantation
	C-8	Middle-current ion implanter	Nissin ion NH-20SR	17,214	4"	Max. 180keV, 0.6mA, P, B, cassette type
	C-9	High-current ion implanter	Sumitomo eaton nova NV-10	17,410	4"	Max. 80keV, 6mA
	C-10	Rapid thermal annealing	AG Associates AG4100	6,694	Max 6"	Max: 1100 degree, 100 degree/sec, cassette type
	C-11	Metal diffusion furnace	Koyo Model270	8,027	max 4"	Max: 1000 degree
CVD, sputtering, evaporation	D-1	LPCVD (SiN)	System service	8,848	Max 6"	SiN
	D-2	LPCVD (Poly-Si)	System service	10,005	Max 6"	Poly-Si
	D-3	LPCVD (SiO <sub>2</sub> )	System service	10,971	Max 6"	SiO <sub>2</sub> (NSG), SiON
	D-4	Thermal CVD	System service	16,973	Max 6"	Epipoly-Si, Poly-Si(non-doped, doped), Max. 1100 degree
	D-5	Sumitomo PECVD	Sumitomo MPX-CVD	13,685	Max 8"	SiN, SiO <sub>2</sub> , Max. 350 degree, low-stress SiN
	D-6	W-CVD	Applied Materials P-5000	8,401	4"	Tungsten CVD
	D-7	Anelva sputtering	Anelva SPF-730	6,158	Max 6"	4" x 9 wafers, 8" x 3 targets
	D-8	Shibaura sputtering	Shibaura CFS-4ESII	3,045	Max 8"	Wafer stage : 200mm, 3" x 3 targets
	D-9	EB evaporation	Anelva EVC-1501	4,599	4", 6"	
	D-10	Automatic sol-gel deposition	Technofine PZ-604	6,361	Max 4"	PZT deposition
	D-11	Electroplating	Yamamoto	2,085	Max 6"	Cu, Ni, Sn, Au
	D-12	MOCVD	Wacom	18,461	Max 8"	PZT deposition
	D-13	JPEL PECVD	JPEL VDS-5600	13,808	4"	SiN, SiO <sub>2</sub>
	D-14	Sumitomo TEOS PECVD	Sumitomo MPX-CVD	15,323	Max 8"	TEOS SiO <sub>2</sub> , SiN, Max. 350 degree, low-stress SiN
	D-15	Automatic Shibaura sputtering	Shibaura I-Miller CFS-4EP-LL	5,505	Max. 8"	Wafer stage : 220mm, 3" x 4 targets, Max. 300 degree, with LL chamber and automatic transfer system up to 10 wafer stages
	D-16	Sputtering for ball	Izumi-tech	3,530	Ball	Sputtering on ball (diameter:1.0,3.3mm), Au, Cr, Al, Pd, SiO <sub>2</sub> , etc. O <sub>2</sub> plasma cleaning
	D-17	ALD	Technofine ALK-600	8,988	Max 6"	Al <sub>2</sub> O <sub>3</sub> etc.
	D-18	High-temp. sputtering and O <sub>2</sub> annealing	Youtec 21-0604	10,561	Max 8"	Max. 700 degree in Metal sputtering chamber (DC) and Oxides sputtering chamber (RF). High-pressure O <sub>2</sub> annealing chamber
	D-19	Anelva multi-sputtering	Anelva SPC-350	6,578	4"	4" x 6 wafers, Max. 600 degree, 6" x 3 targets (DC x 2, RF x 1, simultaneous), with LL chamber, ferromagnetic material possible

Etching	E-1	DeepRIE #1	Sumitomo MUC-21	7,390	Max 6"	Si deep RIE, mechanical cramp
	E-2	DeepRIE #2	Sumitomo MUC-21	7,390	Max 6"	Si deep RIE, mechanical cramp
	E-3	DeepRIE #3	STS	7,674	Max 6"	Si deep RIE, mechanical cramp
	E-4	Anelva RIE	Anelva DEA-506	6,082	Max 6"	SiN, SiO2, gas: CF4, CHF3
	E-5	Anelva Si RIE	Anelva L-507DL	5,841	Max 6"	Si, gas: SF6
	E-6	Al-RIE	Shibaura HIRRIE-100	9,415	Max 6"	Al, Si, gas: Cl2, BCl3, cassette type
	E-7	Ulvac asher	Ulvac UNA-2000	3,206	4"	2.45GHz, cassette type
	E-8	Branson Asher	Branson IPC4000	2,558	Max 6"	13.56MHz
	E-9	ECR etcher	Anelva ECR6001	15,732	Max 3"	gas: Cl2
	E-10	Ulvac RIE	Ulvac RIH-1515Z	8,230	Max 6"	Metals etc., gas: Cl2, BCl3, SF6, CF4, CHF3, Ar, N2, O2
	E-11	KOH etching		2,638	Max 6"	Si anisotropic etching
	E-12	TMAH etching		2,646	Max 6"	Si anisotropic etching
	E-13	DeepRIE #4	Sumitomo MUC-21	13,709	Max 8"	Si deep RIE, electrostatic cramp
	E-14	Ion milling	NS/Hakuto 20IBE-C	10,675	Max. 6"	Ar ion, 4" x 6, 6" x 3
	E-15	Vapor HF etching	Sumitomo Primaxx uEtch	6,957	Max 8"	SiO2 sacrificial etching
	E-16	Ulvac ICP-RIE	Ulvac NE-550	13,655	Max. 6"	SiO2 etc., gas: CF4, CHF3, SF6, Ar, O2, N2, (Cl2, BCl3)
	E-17	Chemical Dry Etcher (CDE)	Shibaura CDE7	5,442	Max 4"	low-damage Si isotropic etching by radicals, removal of DRIE's scallops, gas: CF4, O2, N2
	E-18	Plasma cleaner	Yamato PDC210	2,717	Max. 6"	Ar, O2 plasma for wafer cleaning and resist ashing
Bonding, polishing, packaging	F-1	Wafer bonder	Suss SB6e	4,546	Max 6"	Anodic bonding, metal bonding, polymer bonding
	F-2	Accretech dicer	Accretech	8,841	Max 6"	Cutting water: DI water
	F-3	Disco dicer	Disco DAD-522	1,888	Max 6"	Cutting water: Tap water
	F-4	Wire bonder	West Bond	776	Chip	Al, Au
	F-5	Laser marker	GSI WM-II	1,969	4"	Wafer marking
	F-6	6" wafer polisher	BN technology Bni62	1,679	Max 6"	Polishing and CMP for Si, SiO2, metal
	F-7	4" wafer polisher	BN technology Bni52	1,394	Max 4"	Polishing and CMP for Si, SiO2, metal
	F-8	Sand bluster	Shinto	2,734	Max 6"	Grass drilling
	F-9	EVG wafer bonder	EVG 520	4,678	8"	Thermal compression bonding
	F-10	EVG aligner for wafer bonding	EVG Smart View Aligner	3,915	8"	IR alignment
	F-11	UV imprint	Toshiba machine ST-50	5,112	Max 4"	UV imprint, step & repeat available
	F-12	Thermal imprint	Origin Reprina-T50A	4,750	Max 2"	Max. 650 degree, Max. 30kN
	F-13	Excimer lamp cleaner	Dernaechste EXC-1201-DN	1,077	Max 4"	Organic contamination remover
	F-14	Surface planer	Disco DAS8920	11,842	4", 8"	Au or Cu bump precise planarization
	F-15	Water laser	Shibuya LAMICS AQL-1900	5,087	Max 12"	Si wafer, metal sheet, min. cutting width: 70µm
Measurement	G-1	Wafer dust counter	Topcon WM-3	1,323	Max 6"	
	G-2	Film thickness measurement	Nanometric NanoSpec3000	960	Max 6"	
	G-3	Dektak surface profiler	Dektak 8	1,237	Max 6"	
	G-4	Tencor profiler	Tencor AlphaStep 500	1,237	Max 6"	
	G-5	Depth measurement	Union Hisomet	666	Max 6"	Optical non-contact measurement
	G-6	4-terminal prober		667	Max 6"	Wafer resistivity measurement
	G-7	Spreading resistance measurement	Solid State Measurements SSM150	2,180	Chip	Dopant profile measurement
	G-8	Wafer prober	Accretech EM-20A	2,217	4"	
	G-9	Microscope	Nikon L150	741	Max 6"	
	G-10	Digital microscope	Keyence/Kunoh	1,168	Max 8"	x20-200, x500-5000
	G-11	SEM	Hitachi S3700N	2,208	Max 12"	EDX, high/low vacuum, optical navigation
	G-12	FE-SEM	Hitachi S5000	3,678	Chip	High-resolution SEM
	G-13	Micro X-ray CT	Comscan techno ScanXmate D160TS110	2,620	Max 6"	Non-destructive
	G-14	Ellipsometer	Ulvac	563	Max 6"	Film thickness and refractive index
	G-15	Ultrasonic microscope	Insight IS-350	1,810	Max 12"	Non-destructive, void detection at bonding interface
	G-16	Digital thermal microscope	Apiste FSV-1200	833	Max 6"	Thermal imager, minimum resolution: 10µm
	G-17	Infrared microscope	Olympus/Hamamatsu	818	Max 6"	Double-side alignment check, void detection
	G-18	Quadrupole mass spectrometer	Canon anelva M-101QA-TDM	813		Residual gas monitoring
	G-19	TOF-SIMS	CAMECA TOF SIMS IV	14,247		
	G-20	Quick coater	Sanyu SC-701MkII	933	Max 2"	Pt coating before SEM
	G-22	Desktop Ellipsometer	Photonic lattice SE-101	344	Max 6"	High-speed and compact ellipsometer
	G-23	Large wafer size AFM	Digital Instruments Dimension3100	3,592	Max 12"	Surface measurement of large diameter wafer
	G-24	Laser/white light confocal microscope	Lasertec OPTELICS HYBRID LS-SD	4,491	Max 6"	3D surface measurement, laser/white light, conforcal/non-conforcal
	G-25	Line-focus-beam acoustic microscope #1		3,823	Max 6"	Measurement of leaky SAW (LSAW) velocity of solid sample
	G-26	Line-focus-beam acoustic microscope #2		3,823	Max 8"	Measurement of acoustic velocity of bulk wave of solid sample
	G-27	FIB	SII SMI9200	8,773	Chip	Focus ion beam etching
	G-28	XRD	Bruker AXS D8 DISCOVER	6,822	Max 6"	High temp available