

Ceramic Components for Semiconductor Processing

TECHNOLOGY

DESIGN & SIMULATION TECHNOLOGY

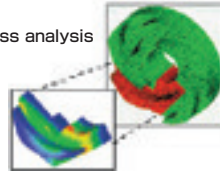
■ SUPER COMPUTER



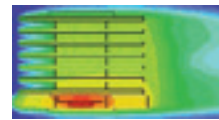
■ Thermal conductivity analysis



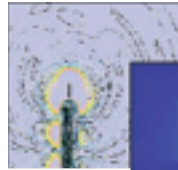
■ Stress analysis



■ Fluid thermal analysis



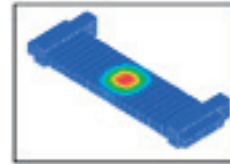
■ Shock analysis



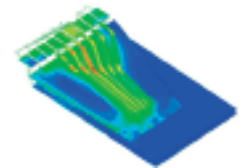
■ Electro magnetic field analysis



■ Piezo electric device vibration analysis



■ Electrical analysis



ANALYSIS TECHNOLOGY

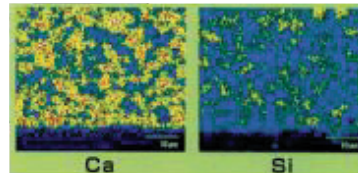
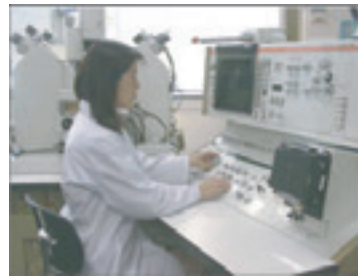
■ TEM



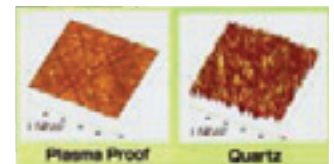
■ XRD



■ EPMA



■ AFM



EVALUATION TECHNOLOGY

■ Electrical evaluation



■ Durability evaluation



■ Mechanical evaluation



■ Thermal friction evaluation



MATERIAL CHARACTERISTICS

Item	Material	Unit	Measuring Method	Alumina (Al ₂ O ₃)					Sapphire (Al ₂ O ₃)	
				AO4790	AO479S	AO479M AO479G	AO480S	A-601L	SA100	
Material Code				AO4790	AO479S	AO479M AO479G	AO480S	A-601L	SA100	
Content Color (%)				99 White	99.5 Ivory	99.5 Ivory	99.7 Ivory	99.9 Ivory	99.99 Transparent	
Density		g/cm ³	JIS R1634	3.8	3.9	3.9	3.9	3.9	3.97	
Water Absorption		%	JIS C 2141	0	0	0	0	0	0	
Vickers Hardness HV9.807N		GPa	JIS R1610	15.2	16.0	15.7	17.2	17.5	a Plane	22.5
Flexural Strength 3 P.B		MPa	JIS R1601	310	400	370	480	500	a Plane c Axis	690
Young's Modulus of Elasticity		GPa		360	370	370	380	380	470	
Poisson's Ratio		-	JIS R1602	0.23	0.23	0.23	0.23	0.23	Parallel to Axis c Vertical to Axis c	0.18
Fracture Toughness (SEPB)		MPa·m ^{1/2}	JIS R1607	3~4	4	4.3	4.3	4.5	2.1	
Coefficient of Linear Thermal Expansion	40°C~400°C	X10 ⁻⁶ /K	JIS R1618	7.2	7.2	7.2	7.2	7.2	Parallel to Axis c Vertical to Axis c	7.7 7.0
	40°C~800°C			8.0	8.0	8.0	8.0	8.0	Parallel to Axis c Vertical to Axis c	8.8 7.9
Thermal Conductivity 20°C		W/(m·K)	JIS R1611	29	32	32	32	34	42	
Specific Heat Capacity		J/(g·K)	JIS R1611	0.79	0.78	0.78	0.79	0.78	0.75	
Thermal Shock Temperature Difference (Put in Water,Relative Method)		°C	JIS R1648	150	180	180	180	180	180	
Dielectric Strength		kV/mm		15	15	15	15	15	48	
Volume Resistivity	20°C	Ω·cm	JIS C2141	>10 ¹⁴	>10 ¹⁴	>10 ¹⁴	>10 ¹⁴	>10 ¹⁴	>10 ¹⁴	
	300°C			10 ¹⁰	10 ¹³	10 ¹³	10 ¹³	10 ¹³	10 ¹²	
	500°C			10 ⁸	10 ¹⁰	10 ¹⁰	10 ¹⁰	10 ¹⁰	10 ¹¹	
Dielectric Constant (1MHz)		-		9.9	9.9	9.9	9.9	9.9	Parallel to Axis c Vertical to Axis c	11.5 9.3
Dielectric Loss Tangent (1MHz)		(X10 ⁻⁴)		2	1	1	1	1	<1	
Loss Factor		(X10 ⁻⁴)		20	10	10	10	10	-	
Nitric Acid (60%) 90°C, 24H		(Weight Loss)		0.10	0.00	0.01	0.05	0.01	≒ 0.00	
Sulphuric Acid (95%) 95°C, 24H				0.33	0.00	0.00	0.22	0.00	≒ 0.00	
Sodium Hydroxide (30%) 80°C, 24H		mg/cm ²		0.26	0.00	0.00	0.04	0.01	≒ 0.00	

Item	Material	Unit	Measuring Method	Silicon Nitride (Si ₃ N ₄)			Silicon Carbide (SiC)		Aluminum Nitride (AlN)		Cordierite (2MgO·2Al ₂ O ₃ ·5SiO ₂)		Yttria (Y ₂ O ₃)	Zirconia (ZrO ₂)	
				SN201B	SN2400	SN2410	SC2110	SC1000	AN216A	AN2000	CO2200	CO7200	YO100A	ZO201N	
Material Code				SN201B	SN2400	SN2410	SC2110	SC1000	AN216A	AN2000	CO2200	CO7200	YO100A	ZO201N	
Content Color (%)				- Black	- Black	- Black	- Black	- Black	- Gray	99.9 Ivory	- Gray	- Gray	- White	- Ivory	
Density		g/cm ³	JIS R1634	3.2	3.3	3.2	3.2	3.16	3.4	3.2	2.5	2.54	4.9	6.0	
Water Absorption		%	JIS C 2141	0	0	0	0	0	0	0	0	0	0	0	
Vickers Hardness HV9.807N		GPa	JIS R1610	13.9	14.0	13.8	22.0	23.0	10.4	11.2	8.0	8.5	6.0	12.3	
Flexural Strength 3 P.B		MPa	JIS R1601	580	1,020	790	600	500	310	220	190	200	130	1,000	
Young's Modulus of Elasticity		GPa		290	300	290	430	440	320	310	140	145	160	200	
Poisson's Ratio		-	JIS R1602	0.28	0.28	0.28	0.16	0.17	0.24	0.24	0.31	0.31	0.3	0.31	
Fracture Toughness (SEPB)		MPa·m ^{1/2}	JIS R1607	4~5	7	6~7	4~5	2~3	3.2	2.5	1~1.5	1~1.5	1.1	6	
Coefficient of Linear Thermal Expansion	40°C~400°C	X10 ⁻⁶ /K	JIS R1618	2.4	2.8	2.9	3.7	3.7	4.6	4.6	1.5(40°C~400°C) 2.1(40°C~800°C)	1.5(40°C~400°C) 2.1(40°C~800°C)	7.2	10.5	
	40°C~800°C			3.2	3.3	3.5	4.4	4.4	5.3	5.2	<0.05(23°C) <0.02(22°C)	<0.05(23°C) <0.02(22°C)	7.6	11.0	
Thermal Conductivity 20°C		W/(m·K)	JIS R1611	25	27	54	60	200	150	67	4	4	14	3	
Specific Heat Capacity		J/(g·K)	JIS R1611	0.64	0.65	0.66	0.67	0.67	0.71	0.72	0.71	0.74	0.45	0.46	
Thermal Shock Temperature Difference (Put in Water,Relative Method)		°C	JIS R1648	550	800	900	400	350	250	200	450	400	-	300	
Dielectric Strength		kV/mm		9.7	13	12	-	-	14	16	19.1	19.3	11	11	
Volume Resistivity	20°C	Ω·cm	JIS C2141	>10 ¹⁴	>10 ¹⁴	>10 ¹⁴	10 ⁵	10 ⁸	>10 ¹⁴	>10 ¹⁴	>10 ¹⁴	>10 ¹⁴	>10 ¹³	10 ¹³	
	300°C			10 ¹²	10 ¹²	10 ¹²	10 ⁴	10 ¹	10 ¹⁰	10 ¹⁰	10 ¹²	10 ¹²	10 ¹²	10 ¹⁰	10 ⁶
	500°C			10 ¹⁰	10 ¹⁰	10 ¹⁰	10 ³	10 ³	10 ⁸	10 ⁹	10 ¹⁰	10 ¹⁰	10 ¹⁰	10 ⁷	10 ³
Dielectric Constant (1MHz)		-		8.9	9.6	9.6	-	-	8.6	8.5	4.9	4.9	11.0	33.0	
Dielectric Loss Tangent (1MHz)		(X10 ⁻⁴)		17.0	19	18	-	-	3	2	9	8.5	5	16	
Loss Factor		(X10 ⁻⁴)		-	-	-	-	-	26	17	30	35	55	520	
Nitric Acid (60%) 90°C, 24H		(Weight Loss)		-	1.11	0.18	0.04	≒ 0.00	-	-	-	-	-	≒ 0.00	
Sulphuric Acid (95%) 95°C, 24H				-	0	0	0.01	≒ 0.00	-	-	-	-	-	0.04	
Sodium Hydroxide (30%) 80°C, 24H		mg/cm ²		-	0.22	0.07	≒ 0.00	≒ 0.00	-	-	-	-	-	0.08	

Unit Conversion Table

1kgf/mm² = 9.807MPa 1cal/(cm·sec·°C) = 418.6W/(m·K)

Notes

- These values are only for reference, showing the measurement results of test pieces specified.
- The values may change dependent on the using conditions and the shape of products.
- For more details, please feel free to contact us.

WAFER MANUFACTURING PROCESS



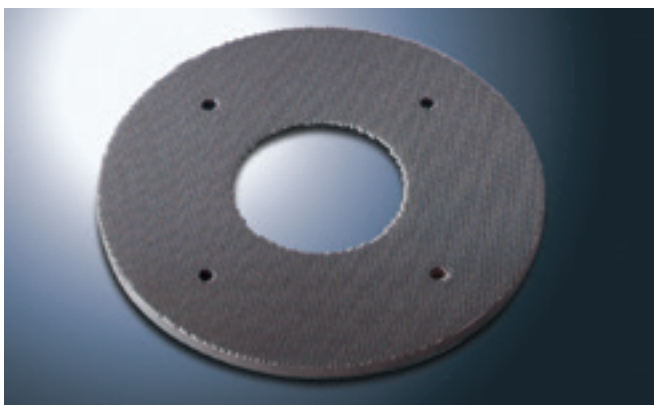
Alumina Wafer Polishing Plate / Turn Table

- Material : Al_2O_3
- Size : Up to 39" in diameter
- Features :
 - High rigidity
 - High chemical durability
 - Surface shape & roughness control



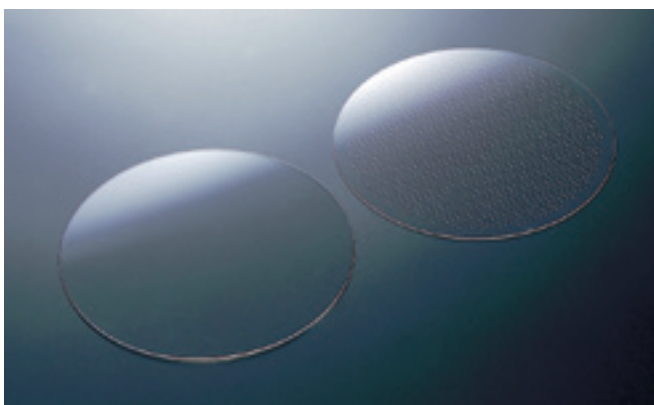
Silicon Carbide Wafer Polishing Plate

- Material : SiC
- Size : Up to 30" in diameter
- Features :
 - High thermal conductivity
 - Low thermal expansion
 - High rigidity



Pad Dresser

- Material : Al_2O_3 , SiC, Si_3N_4
- Features :
 - High wear resistance
 - Square bumps / pyramid bumps



Sapphire Carrier Plate

- Material : Sapphire
- Size : Up to 8" in diameter
- Features :
 - High purity
 - High chemical durability
 - No grain boundary
 - Transparent

DEVICE MANUFACTURING PROCESS



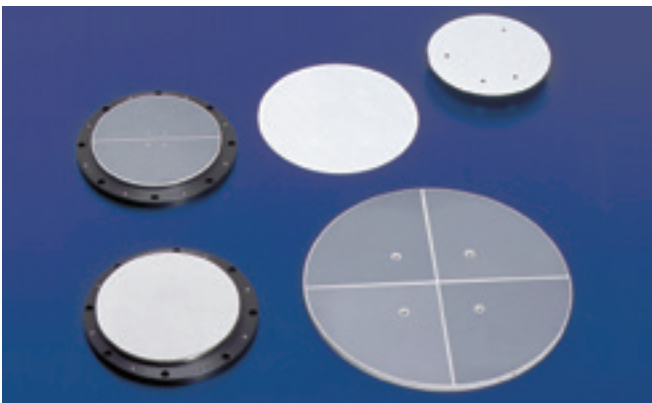
Plasma Proof Dome

- Material : Al_2O_3
- Size : For 200mm / 300mm equipment
- Features :
 - High purity
 - High plasma durability



Plasma Proof Ring

- Material : Al_2O_3 , Y_2O_3
- Size : For 200mm / 300mm equipment
- Features :
 - High purity
 - High plasma durability



Electro-Static Chuck

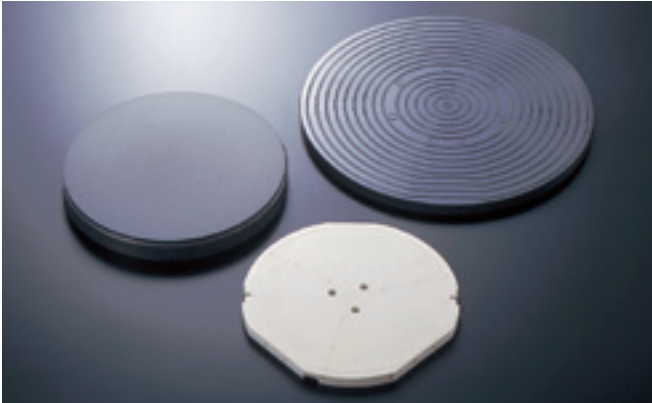
- Material : Al_2O_3 , AlN , Sapphire
- Size : For 200mm / 300mm equipment
- Features :
 - High purity
 - High plasma durability
 - Good chucking / de-chucking response
 - High temp. and low temp. application



Heater

- Material : AlN
- Size : For 200mm / 300mm equipment
- Features :
 - High purity
 - High plasma durability
 - Uniform thermal distribution

DEVICE MANUFACTURING PROCESS



Vacuum Chuck

- Material : Al₂O₃, Porous Al₂O₃, SiC
- Size : For 200mm / 300mm equipment
- Features :
 - High purity
 - High chemical durability
 - Vacuum channel inside
 - Variety surface shape



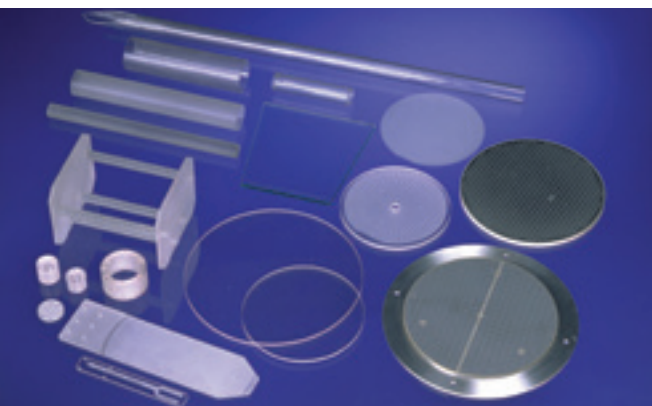
Nozzle

- Material : Al₂O₃
- Size : Nozzle diameter +/-5 μm
- Features :
 - High plasma durability
 - Gas flow rate control



End Effector

- Material : Al₂O₃, SiC, Sapphire
- Size : For 200mm / 300mm equipment
- Features :
 - High purity
 - Vacuum channel inside
 - SiC coating
 - Mirror polished surface

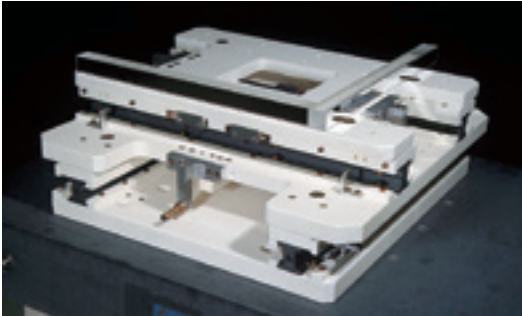


Chamber Window & Tube

- Material : Sapphire
- Features :
 - High purity
 - High plasma durability
 - Transparent
 - High transmission factor

EPOCH-MAKING TECHNOLOGIES

USM Stage - Assembly Technology



- Material : Al₂O₃, Al
Non Magnetic Metal, etc.
- Features : ●Ultrasonic Motor drive
●High positioning accuracy
●Compact design

Metalized Products - Metal Assembly Technology



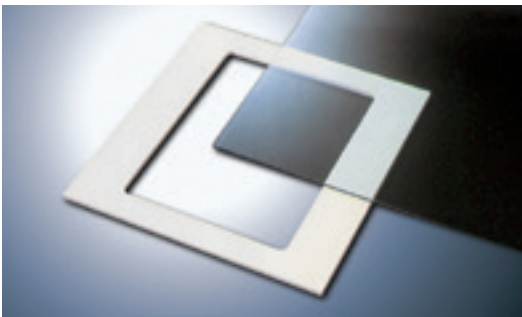
- Material : Al₂O₃, Al, Stainless steel, etc.
- Application : ●IC Packages
●High vacuum component
●High voltage terminal, etc.

Coating Technology



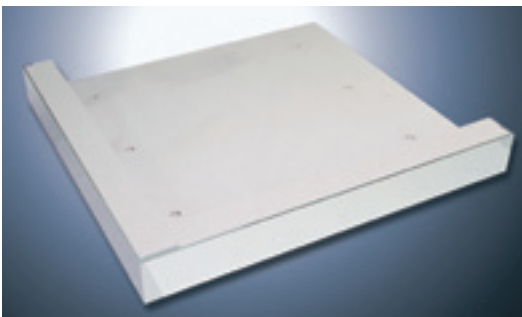
- Material : SiC, DLC, etc.
- Features : ●Discharge of static electricity
●Soft contact

Large Size Product Manufacturing Technology



- Material : Al₂O₃, Y₂O₃, SiC, Si₃N₄
- Application : ●LCD manufacturing equipment
●Lithography equipment

Material Development Technology



example


- Material : Low thermal expansion materials
- Application : ●Lithography equipment
●Wafer Inspection equipment



KYOCERA Corporation

Corporate Fine Ceramics Group

<https://global.kyocera.com/prdct/fc/>

Kyocera Fine Ceramics 

Product Inquiries→



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