Ceramic Material Properties Table 4

※Published data is for reference only

Material / Data / Unit				Ceramic compound material（MMC）									
				Boron nitride based	Boron nitride based	Boron nitride based	Boron nitride based	Boron nitride based	Boron nitride based	Boron nitride based	Boron nitride based	Boron nitride based	Boron nitride based
Main component amount [%]				BN:97%	BN:99.5% and more	BN:99.5% and more	BN:40%	BN:35%	BN:30%	BN:20%	BN:30%	BN:50%	BN:70%
Other component or binder				$CaO \cdot B_2O_3$	binderless	binderless	$Al_2O_3 \cdot SiO_2$	$TiB_2 \cdot AlN$	AlN:70%	AlN:80%	Si_3N_4:70%	Si_3N_4:50%	Si_3N_4:30%
General properties	Color		-	White	White		White					Light grey	
	Density		[g/cm^3]	2.0	1.8	1.6	2.2	3.1	2.8	2.6	2.7	2.5	2.2
	Water absorption		[%]	0.4	0.04								
Machining properties	Hardness (HV)		[GPa]	1.3 20(HS)	0.8 12(HS)	11(HS)	45(HS)	60(HS)	76(HS)	40(HS)	75(HS)	5.5 69(HS)	48(HS)
	Flexural rigidity	20℃	[MPa]	35	30	28	140	160	280	120	300	270	140
		1000℃	[MPa]										
		1200℃	[MPa]										
	Compressive strength		[MPa]										
	Fracture toughness		[MPam$^{1/2}$]										
	Young's modulus		[GPa]	20	10							80	
	Poisson's ratio		-										
Thermal properties	Max. use temp	Oxidizing atmosphere	[℃]	950	950	950	1100	950	950	950	950	950	950
		Non-oxidizing atmosphere	[℃]	1800(inactive) 1600(in vacuo)	2200(inactive) 2000(in vacuo)	2200(inactive) 2000(in vacuo)	1500(inactive) 1400(in vacuo)	2000(inactive) 1700(in vacuo)	1950(inactive) 1800(in vacuo)	1950(inactive) 1800(in vacuo)	1700(inactive) 1500(in vacuo)	1700(inactive) 1500(in vacuo)	1700(inactive) 1500(in vacuo)
	Thermal expansion coefficient	RT～200℃	[*10^{-6}/℃]										
		RT～400℃	[*10^{-6}/℃]	-0.2	-1.8		5.3					2.1	
		RT～600℃	[*10^{-6}/℃]	-0.4	-1.5							2.3	
		RT～800℃	[*10^{-6}/℃]	-0.25(1000℃)	-1.4(1000℃)	-0.6(1000℃)	6.0(1000℃)	7.0(1000℃)	4.3(1000℃)	5.4(1000℃)	3.0(1000℃)	2.6(1000℃)	2.0(1000℃)
	Thermal conductivity	20℃	[W/(m·K)]	36	63	60	8	55	66	95	44	47	33
		400℃	[W/(m·K)]		45								
		800℃	[W/(m·K)]		30								
	Specific heat	RT	[J/(kg·K)]	700	800							700	
		400℃	[J/(kg·K)]	1300	1500							1000	
		800℃	[J/(kg·K)]										
	Impact resistance (ΔT)		[℃]	1500	1500							1500	
Electrical characteristics	Dielectric strength		[kV/mm]	25	25	22	19		21	15	21	36	27
	Volume resistivity	20℃	[Ω·cm]	10*10^{15}	10*10^{15}	10^{15}	0.1*10^{15}	250～1000μ	10^{14}	10^{14}	10^{14}	10*10^{15}	10^{14}
		500℃	[Ω·cm]	10^4 (1200℃)	10^6 (1200℃)	10^6 (1200℃)	3 (500℃)		10^3 (1200℃)	10^4 (1200℃)	10^6 (1200℃)	10^5 (1200℃)	10^5 (1200℃)
	Dielectric constant	1MHz	-	4.0	4.5	4.9	3.0		6.7	7.0	4.9	6.3	4.9
		3GHz	-										
	Dielectric loss	1MHz	[*10^{-4}]	8	9	10	13		18	39	24	53	180
		3GHz	[*10^{-4}]										
Anti-corrosion properties	Chemical resistance	hydrochloric acid	WT Loss [mg/cm^2/day]										
		hydrochloric acid	WT Loss [mg/cm^2/day]										
		sulfuric acid	WT Loss [mg/cm^2/day]										
		sulfuric acid	WT Loss [mg/cm^2/day]										
		nitric acid	WT Loss [mg/cm^2/day]										
		nitric acid	WT Loss [mg/cm^2/day]										
		phosphoric acid	WT Loss [mg/cm^2/day]										
		phosphoric acid	WT Loss [mg/cm^2/day]										
		caustic soda (sodium hydroxide)	WT Loss [mg/cm^2/day]										
		caustic soda (sodium hydroxide)	WT Loss [mg/cm^2/day]										
		hydrogen fluoride	WT Loss [mg/cm^2/day]										
	Abrasiveness	Blast abrasion amount	[μm]										
Features & applications				High temperature insulator Setter for firing ceramics Jig for semi-conductor manufacturing equipment Jig for glass casts Crucible for melting Heat-resistive	High temperature insulator Setter for firing ceramics Jig for semi-conductor manufacturing equipment Jig for glass casts Crucible for melting Heat-resistive	High temperature insulator Setter for firing ceramics Jig for semi-conductor manufacturing equipment Jig for glass casts Crucible for melting Heat-resistive	High temperature insulator Setter for firing ceramics Jig for semi-conductor manufacturing equipment Jig for glass casts Crucible for melting Heat-resistive	Metal deposition			High temperature insulator Setter for firing ceramics Jig for semi-conductor manufacturing equipment Jig for glass casts Crucible for melting Heat-resistive	High temperature insulator Setter for firing ceramics Jig for semi-conductor manufacturing equipment Jig for glass casts Crucible for melting Heat-resistive	High temperature insulator Setter for firing ceramics Jig for semi-conductor manufacturing equipment Jig for glass casts Crucible for melting Heat-resistive
Remarks													