

# Ceramic Material Properties Table 3

※Published data is for reference only

Material		Ceramic compound material (MMC)											
		Silicon carbide based	Silicon carbide based	Silicon carbide based	Silicon carbide based	Silicon carbide based	Silicon carbide based	Silicon carbide based	Silicon carbide based	Silicon carbide based	Silicon carbide based		
Data	Unit	Main component amount [%]											
		SiC:50%	SiC:65%	SiC:70%	SiC:80%	α-SiC:82%	SiC:85%	SiC:25%	SiC:30%	SiC:40%	SiC:70%		
Other component or binder		Si:50%	Si:35%	Si:30%	Si:20%	Si:18%	Si:15%	Al:75%	Al:70%	Al:60%	Al:30%		
General properties	Color	-											
	Density	[g/cm <sup>3</sup> ]	2.8	3.0	3.0	3.0	3.0	3.1	2.8	2.8	2.9	3.0	
	Water absorption	[%]											
Machining properties	Hardness (HV)	[GPa]				20				90(HRB)	93(HRB)	110(HRB) 35(HRC)	
	Flexural rigidity	20°C	[MPa]	300	300	300	250	250	300			380	
		1000°C	[MPa]					220(800°C)					
		1200°C	[MPa]				250(1300°C)	220(1200°C)					
	Compressive strength	[MPa]											
	Fracture toughness	[MPam <sup>1/2</sup> ]	3	3	3			3		15	14	10	
	Young's modulus	[GPa]	280	310	330	350	370 (360-800°C, 340-1200°C)	380	115	125	150	260	
Poisson's ratio	-	0.20	0.20	0.20		0.18	0.20	0.29	0.29	0.29	0.10		
Thermal properties	Max. use temp	Oxidizing atmosphere	[°C]				1350	1350					
		Non-oxidizing atmosphere	[°C]										
	Thermal expansion coefficient	RT~200°C	[*10 <sup>-6</sup> /°C]	2.8	4.7	3.0			3.0	15.0	14.0	13.0	6.0
		RT~400°C	[*10 <sup>-6</sup> /°C]										
		RT~600°C	[*10 <sup>-6</sup> /°C]					3.4(700°C)					
		RT~800°C	[*10 <sup>-6</sup> /°C]				4.5	4.3(1200°C)					
	Thermal conductivity	20°C	[W/(m·K)]	175	210	190		220	210	145	150	155	170
		400°C	[W/(m·K)]				100(350°C)						
		800°C	[W/(m·K)]					60(700°C)					
	Specific heat	RT	[J/(kg·K)]	790	700	700	700	700	700		800	900	1000
400°C		[J/(kg·K)]											
800°C		[J/(kg·K)]				1000(1000°C)	1230(700°C)						
Impact resistance (ΔT)	[°C]												
Electrical characteristics	Dielectric strength	[kV/mm]											
	Volume resistivity	20°C	[Ω·cm]	2*10 <sup>2</sup>	2*10 <sup>1</sup>	2*10 <sup>2</sup>	10 <sup>3</sup>		5*10 <sup>2</sup>			1*10 <sup>5</sup>	
		500°C	[Ω·cm]										
	Dielectric constant	1MHz	-										
		3GHz	-										
Dielectric loss	1MHz	[*10 <sup>-4</sup> ]											
	3GHz	[*10 <sup>-4</sup> ]											
Anti-corrosion properties	Chemical resistance	hydrochloric acid	WT Loss [mg/cm <sup>2</sup> /day]										
		hydrochloric acid	WT Loss [mg/cm <sup>2</sup> /day]										
		sulfuric acid	WT Loss [mg/cm <sup>2</sup> /day]										
		sulfuric acid	WT Loss [mg/cm <sup>2</sup> /day]										
		nitric acid	WT Loss [mg/cm <sup>2</sup> /day]										
		nitric acid	WT Loss [mg/cm <sup>2</sup> /day]										
		phosphoric acid	WT Loss [mg/cm <sup>2</sup> /day]										
		phosphoric acid	WT Loss [mg/cm <sup>2</sup> /day]										
		caustic soda (sodium hydroxide)	WT Loss [mg/cm <sup>2</sup> /day]										
		caustic soda (sodium hydroxide)	WT Loss [mg/cm <sup>2</sup> /day]										
hydrogen fluoride	WT Loss [mg/cm <sup>2</sup> /day]												
Abrasiveness	Blast abrasion amount	[μm]											
Features & applications			Light weight High stiffness Low thermal expansion Vacuum support Pore-free Mirror finish	Light weight High stiffness Low thermal expansion Vacuum support Pore-free Mirror finish				High stiffness Low thermal expansion Vacuum support Pore-free Mirror finish					
Remarks			Pressureless Infiltration Technique	Pressureless Infiltration Technique	Pressureless Infiltration Technique			Pressureless Infiltration Technique	Casting process	Casting process	Pressureless Infiltration Technique		