

MarkeTech Sapphire (Aluminum Oxide - Al₂O₃) Single Crystal

Category : Ceramic , Oxide , Aluminum Oxide

Material Notes:

Data provided by the supplier, MarkeTech International. Sapphire is grown by several methods: Boule form (Czochralski), in plate form, or as tubes, rods and plates. Boules are grown up to 8" diameter and 6" long. Plates can be formed up to 12" square and 1" thick. Rods and tubes can be grown up to 72" long. Sapphire is characterized by its high hardness (next to diamond on the Mohs scale), chemical and thermal stability, high application temperature, and transparency in the IR range. It is widely used as windows for instruments, high temperature parts, and wear resistance. Also used for deposition of III-V nitrides for LEDs, Lasers, etc. Standard orientation: ; GaN Lattice Mismatch 14%. MatWeb lists a large selection of polycrystalline aluminum oxides.

Order this product through the following link:

http://www.lookpolymers.com/polymer_MarkeTech-Sapphire-Aluminum-Oxide-Al2O3-Single-Crystal.php

Physical Properties	Metric	English	Comments
Density	3.98 g/cc	0.144 lb/in ³	
Water Absorption	0.0 %	0.0 %	
Solubility in Water	0.0 %	0.0 %	
a Lattice Constant	4.765 Å...	4.765 Å...	
c Lattice Constant	13.000 Å...	13.000 Å...	
Molecular Weight	101.96 g/mol	101.96 g/mol	

Mechanical Properties	Metric	English	Comments
Knoop Microhardness	1800	1800	parallel to c-axis
	2200	2200	perpendicular to c-axis
Hardness, Mohs	9	9	
Tensile Strength	275 MPa	39900 psi	
	@Temperature 600 Å°C	@Temperature 1110 Å°F	
	345 MPa	50000 psi	
	@Temperature 1000 Å°C	@Temperature 1830 Å°F	
	400 MPa	58000 psi	
	@Temperature 25.0 Å°C	@Temperature 77.0 Å°F	
Modulus of Elasticity	345 GPa	50000 ksi	60Å° to C-axis

Mechanical Properties	352 GPa Metric	51100 ksi English	45Å° to C-axis Comments
	379 GPa	55000 ksi	30Å° to C-axis
	386 GPa	56000 ksi	75Å° to C-axis
Modulus of Rupture	0.350 - 0.690 GPa	50.8 - 100 ksi	
Flexural Strength	2500 - 4000 MPa	363000 - 580000 psi	
Bulk Modulus	240 GPa	34800 ksi	
Poissons Ratio	0.25 - 0.30	0.25 - 0.30	
Coefficient of Friction	0.10	0.10	vs. self
	0.15	0.15	vs. steel

Thermal Properties	Metric	English	Comments
CTE, linear	5.00 Åµm/m-Å°C	2.78 Åµin/in-Å°F	perpendicular to optical axis
	@Temperature 50.0 Å°C	@Temperature 122 Å°F	
	6.67 Åµm/m-Å°C	3.71 Åµin/in-Å°F	parallel to optical axis
	@Temperature 50.0 Å°C	@Temperature 122 Å°F	
	8.31 Åµm/m-Å°C	4.62 Åµin/in-Å°F	perpendicular to optical axis
	@Temperature 20.0 - 1000 Å°C	@Temperature 68.0 - 1830 Å°F	
	8.40 Åµm/m-Å°C	4.67 Åµin/in-Å°F	60Å° to c-axis
	@Temperature 20.0 - 1000 Å°C	@Temperature 68.0 - 1830 Å°F	
Specific Heat Capacity	9.03 Åµm/m-Å°C	5.02 Åµin/in-Å°F	parallel to c-axis
	@Temperature 20.0 - 1000 Å°C	@Temperature 68.0 - 1830 Å°F	
	0.105 J/g-Å°C	0.0251 BTU/lb-Å°F	
	@Temperature -182 Å°C	@Temperature -296 Å°F	
	0.761 J/g-Å°C	0.182 BTU/lb-Å°F	
	@Temperature 17.9 Å°C	@Temperature 64.1 Å°F	
Thermal Conductivity	23.1 W/m-K	160 BTU-in/hr-ftÅ²-Å°F	perpendicular to c-axis
	25.2 W/m-K	175 BTU-in/hr-ftÅ²-Å°F	parallel to c-axis

Melting Point Thermal Properties	2040 Å°C Metric	3700 Å°F English	Comments
Maximum Service Temperature, Air	1800 Å°C	3270 Å°F	

Optical Properties	Metric	English	Comments
Refractive Index	1.586	1.586	
	@Wavelength 5777 nm	@Wavelength 5777 nm	
	1.633	1.633	
	@Wavelength 4255.3 nm	@Wavelength 4255.3 nm	
	1.702	1.702	
	@Wavelength 3032.6 nm	@Wavelength 3032.6 nm	
	1.732	1.732	
	@Wavelength 2249.2 nm	@Wavelength 2249.2 nm	
	1.743	1.743	
	@Wavelength 1693.2 nm	@Wavelength 1693.2 nm	
	1.753	1.753	
	@Wavelength 1128.6 nm	@Wavelength 1128.6 nm	
	1.755	1.755	
	@Wavelength 1013.9 nm	@Wavelength 1013.9 nm	
1.757	1.757		
@Wavelength 894.4 nm	@Wavelength 894.4 nm		
1.763	1.763		
@Wavelength 706.5 nm	@Wavelength 706.5 nm		
1.765	1.765		
@Wavelength 579.0 nm	@Wavelength 579.0 nm		
1.770	1.770		
@Wavelength 546.0 nm	@Wavelength 546.0 nm		
1.785	1.785		
@Wavelength 404.6 nm	@Wavelength 404.6 nm		
1.793	1.793		

Optical Properties	Metric	English	Comments
	1.798 @Wavelength 365.0 nm	1.798 @Wavelength 365.0 nm	
	@Wavelength 346.6 nm	@Wavelength 346.6 nm	
	1.809 @Wavelength 313.0 nm	1.809 @Wavelength 313.0 nm	
	@Wavelength 280 nm	@Wavelength 280 nm	
	1.824 @Wavelength 265 nm	1.824 @Wavelength 265 nm	
	@Wavelength 265 nm	@Wavelength 265 nm	
Transmission, Visible	85 % @Wavelength 380 - 700 nm, Thickness 1.00 mm	85 % @Wavelength 380 - 700 nm, Thickness 0.0394 in	Visible
IR Transmittance	70 % @Thickness 1.00 mm, Wavelength 5500 nm	70 % @Thickness 0.0394 in, Wavelength 5500 nm	
	85 % @Wavelength 750 - 5000 nm, Thickness 1.00 mm	85 % @Wavelength 750 - 5000 nm, Thickness 0.0394 in	
UV Transmittance	50 % @Thickness 1.00 mm, Wavelength 200 nm	50 % @Thickness 0.0394 in, Wavelength 200 nm	
	60 % @Thickness 1.00 mm, Wavelength 280 nm	60 % @Thickness 0.0394 in, Wavelength 280 nm	
	80 % @Wavelength 300 - 400 nm, Thickness 1.00 mm	80 % @Wavelength 300 - 400 nm, Thickness 0.0394 in	
Reflection Coefficient, Visible (0-1)	0.14 @Wavelength 1000 nm	0.14 @Wavelength 1000 nm	reflection loss, 2 surfaces

Electrical Properties	Metric	English	Comments
Electrical Resistivity	1.00e+11 - 1.00e+16 ohm-cm @Temperature 20.0 -	1.00e+11 - 1.00e+16 ohm-cm @Temperature 68.0 -	

Electrical Properties	500 Å°C Metric	932 Å°F English	Comments
Dielectric Constant	9.4	9.4	perpendicular to c-axis
	11.5	11.5	parallel to c-axis
Dielectric Strength	4.00 kV/mm	102 kV/in	
Dissipation Factor	0.0001	0.0001	

Descriptive Properties	Value	Comments
Crystal Structure	Hexagonal	

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