

# SAPPHIRE COMPARED WITH OTHER MATERIALS

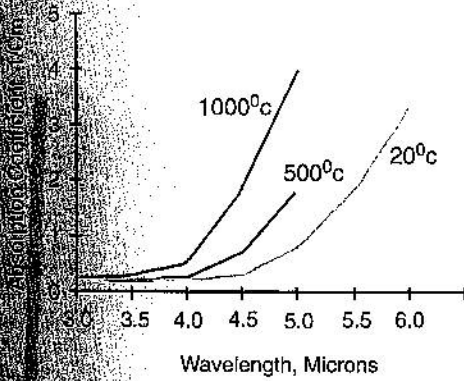
	PROPERTIES	UNITS	Sapphire (parallel to C axis)	Sapphire (perpen- dicular to C axis)	Alumina 99.9%	Alumina 99.5%	Quartz	Silicon Carbide	Silicon Nitride	Aluminum Nitride
PHYSICAL	Density	g/cm <sup>3</sup>	3.97	3.97	3.96	3.98	2.20	3.1	3.18-3.30	3.25
	Young's Modulus	GPa at R.T.	435		386	372	70	393	311	300
	Modulus of rigidity (shear)	GPa at R.T.	175		158	152	31	166		
	Poisson's Ratio		0.27-0.30	0.27-0.30	0.22	0.22	0.17	1.19		
	Flexural Strength	MPa	1035	760	550	350	80	462	338-900	300
	Compressive Strength	MPa at R.T.	2000		3700	2600	550-1100	2500		
	Hardness	Knoop	1900	2200	1440	1551	1250	2500		1050
ELECTRICAL	Volume Resistivity	ohm-cm at R.T.	$1 \times 10^{16}$	$1 \times 10^{16}$	$1 \times 10^{14}$	$1 \times 10^{14}$	$7 \times 10^7$	$1 \times 10^8$	$1 \times 10^{12}$	$>1 \times 10^{14}$
	Dielectric Strength	volts/cm	480,000	480,000	315,000	331,000	500,000			
	Dielectric Constant	$10^3$ - $10^9$ Hz	11.5	9.3	9.8	9.7	3.75			8.5
	Loss Tangent	$\times 10^{-5}$ @ $10^{10}$ Hz	8.6	3.0	2.0	2.0	0.4			
	Magnetic Susceptibility	$\times 10^{-6}$	-0.21	-0.25						
THERMAL	Melting Point	°C	2053	2053			1683			
	Maximum usable temperature	°C	2000	2000	1900	1750	1200	1400	1200-1400	1600
	Specific Heat	cal/g°K at R.T.	0.181	0.181	0.21	0.20	0.16	0.15	0.17	
	Thermal Conductivity	watts/m°K at R.T.	40	40	39	36	1.4	125	12-15	115
	Coefficient of Thermal Expansion	$\times 10^{-6}$ at 25-1000 °C	8.8	7.9	8.4	8.2	0.55	4.3	3.0	5.7
OPTICAL	Refractive Index		1.768	1.76	opaque	opaque	1.46	opaque	opaque	opaque
	Optical Transmission Range (80%)	nm (100cm thick)	200-3500	200-3500	opaque	opaque	270-2400	opaque	opaque	opaque

**Note:**

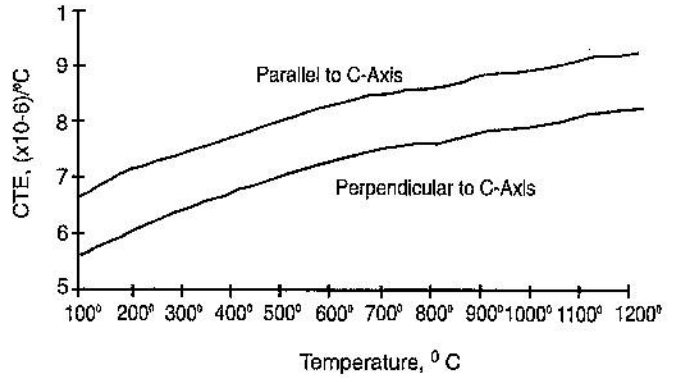
The property data presented above was compiled from multiple sources and is intended for use as a general reference.

# SAPPHIRE PROPERTIES

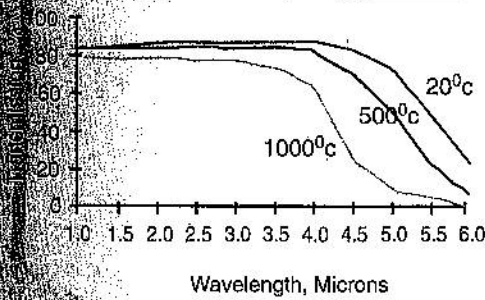
Absorption Coefficient vs. Wavelength



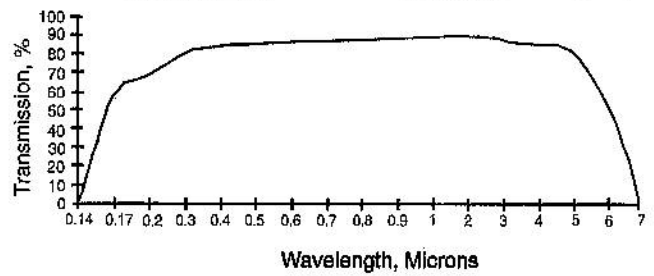
Thermal Expansion vs. Temperature



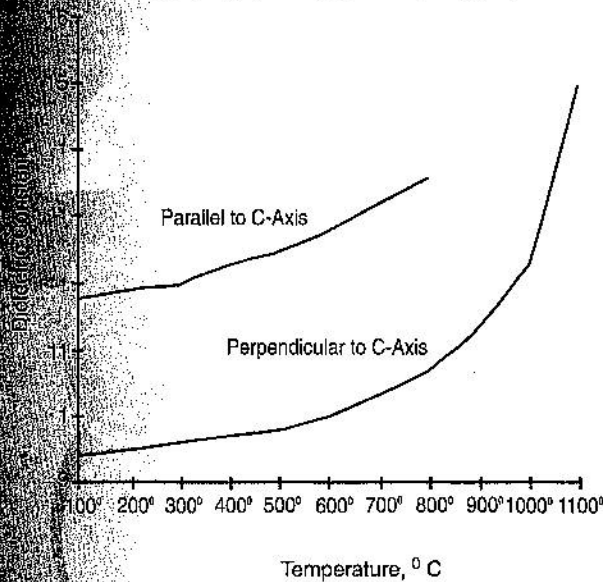
IR Transmission vs. Wavelength



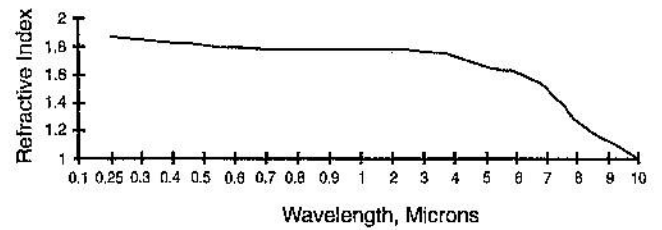
Transmission vs. Wavelength at 1 mm thickness



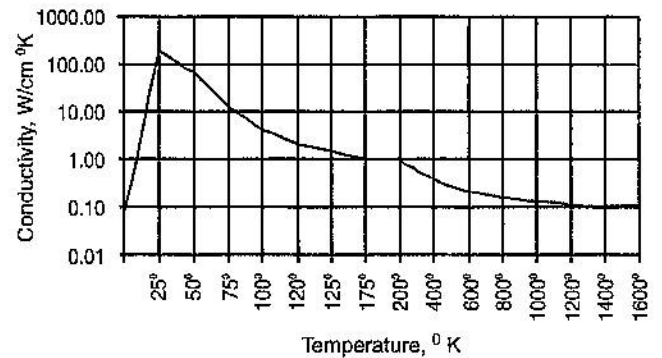
Dielectric Constant vs. Temperature



Refractive Index vs. Temperature



Thermal Conductivity (0 to 1600 K)



[www.gavish.com](http://www.gavish.com)

**Headquarters & Manuf. Facility:**  
 GAVISH Industrial Technologies &  
 Materials (1995) Ltd.  
 Alumot 9, Omer Industrial Park,  
 20025

**US Sales Office:**  
 Gavish Inc.  
 337 Route 101  
 Bedford, NH 03110  
 U.S.A.