Spinel ($MgAl_2O_4$)

Spinel is a naturally occurring material often used as a gemstone. Optical spinel is a fused compacted ceramic material formed from spinel powder. It is polycrystalline with a grain size in the range of 25µm to 150µm.

APPLICATIONS: Spinel is becoming favoured for use for in harsher environments requiring extreme strength. As a sintered ceramic material it exhibits more strength than single crystal material.

Transmission Range	0.3 to 5µm
Refractive Index	1.71 at 0.6µm
Reflection Loss	13% at 0.6µm
Absorption Coefficient	0.02 cm^{-1} at 0.6µm
Reststrahlen Peak	NA
dn/dT	12 x 10^{-6} K^{-1}
dn/dµ = 0	NA
Density	3.58 g/cc
Melting Point	2135°C
Thermal Conductivity	14.6 W m^{-1} K^{-1} (varies with porosity)
Thermal Expansion	6.5 x 10^{-6} /K
Hardness	Knoop 1140 with 1000g indenter (8 Moh)
Specific Heat Capacity	1086 J Kg^{-1} K^{-1}
Dielectric Constant	8
Youngs Modulus (E)	195 GPa
Shear Modulus (G)	157 Gpa
Bulk Modulus (K)	200 Gpa
Elastic Coefficients	C_{11}=298; C_{12}=154; C_{44}=157 (2)
Apparent Elastic Limit	170 MPa (24,600 psi)
Poisson Ratio	0.26
Solubility	Insoluble
Molecular Weight	142.27
Class/Structure	Cubic. $Fd\bar{3}m$ (# 227) Irregular cleavage (111) Polycrystalline in optical usage.

(1) https://www.mindat.org/min-3729.html
(2) Schreiber, Elastc Moduli of Single Crystal Spinel, J.App.Phys 38, 2508 (1967)

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µm	No	µm	No	µm	No	µm	No	µm	No
0.36	1.7461	0.70	1.7111	2.0	1.686	4.0	1.635	6.667	1.491
0.40	1.7368	1.042	1.702	2. 5	1.677	5.0	1.594	6.897	1.473
0.50	1.7229	1.25	1.698	3.125	1.662	5.556	1.565		
0.60	1.7156	1. 471	1.695	3.704	1.645	6.25	1.522