Material Characteristics

Physical Properties	Units	Zirconia	Alumina	Sapphire	Ruby	Polyruby	Silicon Nitride	TiC	TiN	Samarium Cobalt	Neodymium-Iron-Boron
Composition	-	ZrO_2-Y_2O_3	Al_2O_3 -MgO	Al_2O_3	Al_2O_3 ($+Cr_2O_3$)	Al_2O_3 $+Cr_2O_3$	Si_3N_4	TiC-Ni	TiN-Ni	SmCo5 / Sm_2Co_{17}	$Nd_2Fe_{14}B$
Structure	-	Tetragonal	Rhomboedral Hexagonal	Rhomboedral Hexagonal	Rhomboedral Hexagonal	Rhomboedral Polycrystal	Hexagonale Cubique	Cubic Face-centered	Cubic Face-centered	-	-
Density	[g·cm^{-3}]	5.68-6.07	3.95	3.98	3.98	3.98	2.37-3.44	4.9	5.4-5.7	8.4	7.6
Color	-	Black/White/Colors	White	White transparent	Red translucent	Red transluscent	Grey/Brown/Bronze	Grey	Pink / Yellow	Grey	Grey
Mechanical Properties											
Hardness Vickers	[HV]	1200-1300 HV10	1900 HV0.5	2000 HV0.5	2000 HV0.5	2000 HV0.5	1500-1600 HV10	1750 HV30	1250 HV30	550 / 640	575
Fracture thoughness ($K1_C$)	[MPa·$\sqrt{m}$]	5.5-6.5	2-3	-	-	-	5	7	8-9.5	-	-
Young's Modulus	[GPa]	200-220	380	400	400	200	270-330	400	400	110 / 150	150
Poisson's ratio	-	0.31	0.23	0.32 – 0.36	0.32 – 0.36	0.25	0.28	0.21	0.21	-	-
Bending strength	[MPa]	1000	500	200	200	400	850	1470	1470	120 / 150	270
Compressive strength	[MPa]	2200	1700-2500	2000	2000	2000	1000-3000	2500	3430	1000 / 650	1050
Thermal Properties											
Maximum use temperature	[°C]	1000	1700-1800	1700	1700	1200	1800	2000	2000	200 / 300	100
Specific heat @100°C	[kJ·kg^{-1}·K^{-1}]	0.4	0.9	0.75	0.75	1.0	0.6-0.7	0.8	0.8	0.37 / 0.39	0.44
Thermal conductivity @20°C	[W·m^{-1}·K^{-1}]	1.5-3	24-39	40	40	40	15-25	29	25	10 / 10	12
Linear dilatation coefficient	[10^{-6}·K^{-1}]	10-11.4	7.5-9.5	7.9 – 8.8	7.9 – 8.8	7.5-9.5	1.7-3.8	7.4-7.8	5.7-7.1	7 - 13 / 10 – 12 depending on magnetic axis	5.5 – (-0.5) depending on magnetic axis
Electrical Properties											
Resistivity @20°C	[Ω·cm]	$1{\cdot}10^{12}$	$5{\cdot}10^{14}$	$1{\cdot}10^{16}$	$1{\cdot}10^{16}$	$5{\cdot}10^{14}$	$1{\cdot}10^{16}$	-	-	$0.8{\cdot}10^{-4}$	$1.4{\cdot}10^{-4}$
Dielectric constant @20°C/1MHz	-	28-33	9	7.5 – 10.5	7.5 – 10.5	9	8-9.6	-	-	-	-
Dielectric strength @50Hz	[kV·mm^{-1}]	11-13	19	17	17	19	12-19	-	-	-	-
Magnetic Properties											
Remanence	[T]	-	-	-	-	-	-	-	-	0.98 / 1.09	1.40
Coercive field	[kA·m^{-1}]	-	-	-	-	-	-	-	-	1000/700	1100
Energy density (max)	[kJ·m^{-3}]	-	-	-	-	-	-	-	-	180 / 220	380

All values in this table are indicative and purposed to a quick and simple material comparison. Technical characteristics remain non-contractual

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