



# GNP Graystar

Specialty Materials

## Thermal Properties of Ceramics

### Oxides

Compound	Density g/cm <sup>3</sup>	Specific Heat Capacity J/(gk)	Youngs Modulus Gpa	Thermal Conductivity W/(mK)	Coefficient of Linear Expansion x 10 <sup>-6</sup> /K	Melting Temp (°C)	Molar Mass (g/mol)
Aluminum Oxide (Al <sub>2</sub> O <sub>3</sub> )	3.94	0.77	220-350	24-39	5.4	2050	101.96
Yttrium Oxide (Y <sub>2</sub> O <sub>3</sub> )	5.01	0.45	200-205	8-12	7.3	2410	225.81
Zirconium Dioxide (ZrO <sub>2</sub> )	5.7-6.6	0.45	190-210	1.5-3	7-12	2680	123.22
Titanium Dioxide (TiO <sub>2</sub> )	4.24	0.7	270-280	3-4	8-10	1855	79.9
Magnesium Oxide (MgO)	3.58	0.92	90	32-63	12-13	2852	40.32
Zinc Oxide (ZnO)	5.61	0.49	120	54	4.3-6.7	1975	81.39
Aluminum Titanate (Al <sub>2</sub> O <sub>3</sub> +TiO <sub>2</sub> )	3.68	0.75	10-50	2	-5-20	1894	181.83
Bium Titanate (BaO+ TiO <sub>2</sub> )	5.85	0.44	67	5-6	6.3	1620	233.19
Lanthanum Zirconate (La <sub>2</sub> Zr <sub>2</sub> O <sub>7</sub> )	6.04	0.35	175	2	9	2300-2310	572.26
(Sinter) Mullite (3Al <sub>2</sub> O <sub>3</sub> ·2SiO <sub>2</sub> )	3.2	0.75	100-200	2-15	4.5-5.6	1850	426.08
Silicon Dioxide (SiO <sub>2</sub> )	2.19-2.66	0.75	30-80	1-11	0.4-10.3	1713	60.1
Cordierite (Mg <sub>3</sub> Al <sub>4</sub> Si <sub>5</sub> O <sub>18</sub> )	2.55-2.57	0.75	100-150	1-1.5	0.5-2.0	1470	585
Steatite (Mg <sub>3</sub> Si <sub>4</sub> O <sub>10</sub> (OH) <sub>2</sub> )	2.6-2.8	0.98	60-110	3.3	6-9	800	379
Porcelain	2.0-2.6	0.76-0.90	60-100	1-4	1-8	-	-
Beryllium Oxide (BeO)	3.01	25.2	287-345	260-330	6	2507	25.01



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### Carbides / Nitrides

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Silicon Carbide (SiC)	3.21	0.66	150-450	100-350	3.3	2300	40.1
Silicon Carbide (SiC-SiSiC)	3.1-3.2	0.800	170-420	100-120	4.0-5.8	1410	-
Boron Carbide (B <sub>4</sub> C)	2.51	0.92	390-440	30-45	6-Apr	2350	195.86
Tungsten Carbide (WC)	15.63	0.18	450-650	40-80	3.7-4.7	2870	195.86
Tantalum Carbide (TaC)	14.5	0.19	150-600	180	4.1-6.3	3800	192.96
Titanium Car- bide (TiC)	4.94	0.54	440-500	110	4.1-7.7	3100	59.88
Boron Nitride	2.5-3.45	0.8	14-47	10-35	1.8	2968	24.83
Silicon Nitride (Si <sub>3</sub> N <sub>4</sub> )	3.44	0.7	80-330	15-25	1.7-3.8	1900	140.28
Titanium Nitride (TiN)	5.22	0.59	251	22-29	4.1-9.35	2950	61.91
Aluminum Nitride (AlN)	3.26	0.71	320	70-285	2.5-57	2200	40.99



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### Borides / Carbons / Metals

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Magnesium Diboride (MgB <sub>2</sub> )	2.57	1.05	-	10-70	8	800	45.93
Titanium Diboride (TiB <sub>2</sub> )	4.52	0.63	370-570	60-120	5.6-10	2970	69.49
Zirconium Di- boride (ZrB <sub>2</sub> )	6.09	0.42	344-440	23	5.2-6.7	3246	112.84
Carbon - Graphite (C)	1.8-2.1	6.155	1050	119-165	8	4827	12.01
Carbon - Diamond (C)	3.51	6.155	1220	2000	0.9	3550	12.01
Aluminum (Al)	2.7	0.902	69	237	23.1	660	26.98
Gold (Au)	19.3	0.129	27	318	14.2	1064	196.96
Copper (Cu)	8.96	0.385	110-128	401	16.5	1084	63.54
Lead (Pb)	11.34	0.16	16	35.3	28.9	327	207.2
Molybdenum (Mo)	10.28	250	329	139	4.8	2623	95.96
Tungsten (W)	19.25	0.134	411	173	4.5	3422	183.84

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