



E L E C T R O N I C S

Material properties of Rubalit®,
Alunit® and Zirkolit®

Advanced Ceramics
for Electronic
Applications

CA210105/EN/2111/IM

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Material Properties of Rubalit®, Alunit® and Zirkolit®

Property	Definition Property	Unit	Range	Zirkolit® ZrO2 5Y C***	Rubalit® 708 D**	Rubalit® 708S C***	Rubalit® 708 HP C***	Rubalit® 710F C***	Rubalit® 717 porous C***	Thomit® 600 D**	Alunit® AlN 170 C***	Alunit® AlN 170 D**
Al2O3 content		[wt-%]	≥		95.8	96.0	96.0	+/- 99.6	98.5	45.0		
Surface roughness Ra	@ as fired surface	[µm]	≤	0.2	0.8	0.6	0.6	0.12	0.4	0.9	0.6	1.0
Density		[g/cm²]	≥	5.7	3.73	3.73	3.73	3.80	3.00		3.26	3.28
Bending strength DR sigma 0	double ring method @ 0.32 mm; thickness @ rings 6 / 12 mm double ring method @ 0.50 mm; thickness @ rings 6 / 12 mm double ring method @ 0.63 mm; thickness @ rings 6 / 12 mm double ring method @ 1.00 mm; thickness @ rings 6 / 12 mm double ring method @ 1.00 mm; thickness @ rings 7 / 14 mm double ring method @ 1.50 mm; thickness @ rings 6 / 12 mm	[MPa] [MPa] [MPa] [MPa] [MPa]	≥ ≥ ≥ ≥ ≥	800	300 300	450	450	420 420	200	130	320 320	200
Coefficient of thermal expansion (CTE)	@ 100°C – 200°C @ 100°C – 300°C @ 100°C – 600°C @ 100°C – 800°C	[10–6/K] [10–6/K] [10–6/K] [10–6/K]	+/- +/- +/- +/- +/-	9 – 12 9 – 12 9 – 12 9 – 12		6.0 – 8.0 6.0 – 8.0 6.7 – 8.7 7.0 – 9.0	6.0 – 8.0 6.0 – 8.0 6.7 – 8.7 7.0 – 9.0	6.0 – 8.0 6.0 – 8.0 6.7 – 8.7 7.0 – 9.0	6.3 – 8.3 6.4 – 8.4 6.9 – 8.9 7.2 – 9.2	5.0 – 7.0 5.0 – 7.0 5.5 – 7.5 5.5 – 7.5	3.7 – 5.7 3.7 – 5.7 4.5 – 5.9 4.8 – 6.2	3.5 – 5.5 4.0 – 6.0 4.5 – 6.5 4.6 – 6.7
Dielectric constant	@ 1 GHz @ 2mm thickness @ Ra <= 0,4 µm @ 10 MHz @ 2mm thickness @ Ra <= 0,4 µm @ 100 MHz @ 2mm thickness @ Ra <= 0,4 µm	-/- -/- -/-	+/- +/- +/-		8.3 – 11.3 8.3 – 11.3 8.3 – 11.3	8.3 – 11.3 8.3 – 11.3 8.3 – 11.3	8.3 – 11.3 8.3 – 11.3 8.3 – 11.3	8.5 – 11.5 8.5 – 11.5 8.5 – 11.5			7.2 – 9.8 7.2 – 9.8 7.2 – 9.8	
Dielectric loss factor	@ 1 GHz @ 2mm thickness @ Ra <= 0,4 µm @ 10 MHz @ 2mm thickness @ Ra <= 0,4 µm @ 100 MHz @ 2mm thickness @ Ra <= 0,4 µm	[10 ⁻³] [10 ⁻³] [10 ⁻³]	≤ ≤ ≤		10 10 10	10 10 10					10 10 10	
Dielectric strength	@ 0.500 mm thickness @ 0.635 mm thickness @ 1.000 mm thickness	[kV/mm] [kV/mm] [kV/mm]	≥ ≥ ≥	10		15	15	15		15	15 15	
Open porosity	@ oxidized anode	[vol-%]	+/-	none								
Specific heat capacity	@ 100°C @ 20°C	[J/g K] [J/g K]	≥ ≥	0.4 0.3	0.9 0.7	0.7 0.7	0.8 0.7	0.8 0.7			0.7 0.6	0.7 0.6
Thermal conductivity*	@ 20°C @ Xe-flash @ sample 16*16 mm² @ material specific thickness <= 3,5 mm	[W/mK]		1.5	22.0	22.0	22.0	25.0	18.0	2.0	170	170
Volume resistivity	@ 20°C @ 200°C @ 400°C @ 600°C @ 800°C	[Ohm cm] [Ohm cm] [Ohm cm] [Ohm cm] [Ohm cm]	≥ ≥ ≥ ≥ ≥		10 ¹³ 10 ¹¹ 10 ⁹ 10 ⁷	10 ¹³ 10 ¹¹ 10 ⁹ 10 ⁷ 10 ⁷	10 ¹³ 10 ¹¹ 10 ⁹ 10 ⁷ 10 ⁷	10 ¹³ 10 ¹¹ 10 ⁹ 10 ⁷ 10 ⁷			10 ¹⁴ 10 ¹³ 10 ¹² 10 ⁹ 10 ⁹	10 ¹⁴ 10 ¹³ 10 ¹² 10 ⁹
Chemical composition		-/-		The material main component is ZrO ₂ . Additional components are Y ₂ O ₃ and traces of other elements.	The material main component is Al ₂ O ₃ . Residue mainly consists of MgO, SiO ₂ and CaO and traces of other elements.	The material main component is Al ₂ O ₃ . Residue mainly consists of MgO, SiO ₂ and CaO and traces of other elements.	The material main component is Al ₂ O ₃ . Residue mainly consists of MgO, SiO ₂ and CaO and traces of other elements.	The material main component is Al ₂ O ₃ . Residue mainly consists of MgO and traces of other elements.	The material main component is Al ₂ O ₃ . Residue mainly consists of MgO, SiO ₂ and CaO and traces of other elements.			

* typical value based on a measurement precision of +/- 10%
** Dry pressed
*** Tape casted

Indexes and parameters for ceramic substances
In order to profile ceramic substances certain parameters are indicated. The crystalline nature of these substances, statistical fluctuations in the composition of the substances and in the factors that impact on the production processes indicate that the figures quoted are typically mean values and hence the substance parameters quoted in this brochure are only standard, recommended or guide values that might differ given dissimilar dimensions and production processes.