



			Standard Alumina					
			AL74 74%	AL95 95%	AL96 96%	AL96P 95.5%	AL98 98%	
	Property	ASTM Method	Units					
General	Crystal Size (Average)	Thin Section	Microns	13	11	8	9	7
	Color	--	--	White	Ivory	White	Purple	White
	Gas Permeability	--	atms-cc/sec	gas tight <10 <sup>-10</sup>	gas tight <10 <sup>-10</sup>	gas tight <10 <sup>-10</sup>	gas tight <10 <sup>-10</sup>	gas tight <10 <sup>-10</sup>
	Water Absorption	C 20-97	%	0	0	0	0	0
Mechanical	Density	C 20-97	g/cc	3.03	3.65	3.71	3.68	3.78
	Hardness	Vickers 500 gm	GPa (kg/mm <sup>2</sup> )	10.5 (1075)	11.5 (1175)	12.7 (1300)	12.7 (1300)	12.7 (1300)
	Hardness	--	R45N	78	79	81	81	81
	Fracture Toughness	Notched Beam	MPam <sup>1/2</sup>	2 - 5	3 - 4	4 - 5	4 - 5	4 - 5
	Flexural Strength (MOR) (3 point) @ RT°	F417-87	MPa (psi x 10 <sup>3</sup> )	241 (35)	310 (45)	358 (52)	331 (48)	393 (57)
	Tensile Strength @ RT°	--	MPa (psi x 10 <sup>3</sup> )	117 (17)	151 (22)	200 (29)	159 (23)	221 (32)
	Compressive Strength @ RT°	--	MPa (psi x 10 <sup>3</sup> )	1378 (200)	1827 (265)	2068 (300)	1965 (285)	2241 (325)
	Elastic Modulus	C848	GPa (psi x 10 <sup>6</sup> )	172 (25)	303 (44)	310 (45)	310 (45)	345 (50)
	Poisson's Ratio	C848	--	0.22	0.22	0.22	0.22	0.23
Thermal	C.T.E. 25 - 100° C	C 372-96	x 10 <sup>-6</sup> /C	5.5	6.1	6.0	6.3	6.2
	C.T.E. 25 - 300° C	C 372-96	x 10 <sup>-6</sup> /C	5.8	7.0	6.8	6.9	6.8
	C.T.E. 25 - 600° C	C 372-96	x 10 <sup>-6</sup> /C	6.3	7.7	7.5	7.6	7.6
	Thermal Conductivity @ RT°	C 408	W/m K	4	19	23	21	29
	Max Use Temp (non-loading) (at high strength)	--	Fahrenheit (°F)	2800	3000	3100	3100	3100
--		Celsius (°C)	1540	1650	1700	1700	1700	
Electrical	Dielectric Strength (.125" Thick)	D 149-97A	V/mil	225	250	250	250	260
	Dielectric Constant @ 1 MHz	D 150-98	--	7.0	9.0	9.1	9.0	9.5
	Dielectric Constant @ Gigahertz	D 2520-95	--	--	9.2	9.1	8.9	9.4
				--	11.0	10.9	10.8	9.8
	Dielectric Loss @ 1 MHz	D 150-98	--	0.0012	0.0006	0.0004	0.0006	0.0006
	Dielectric Loss @ Gigahertz	D 2520-95	--	--	0.0009	0.0007	0.0006	0.0005
				--	12.5	10.9	10.8	9.8
	Volume Resistivity, 25°C	D 257	ohms-cm	> 1 x 10 <sup>13</sup>	> 1 x 10 <sup>14</sup>	> 1 x 10 <sup>14</sup>	> 1 x 10 <sup>13</sup>	> 1 x 10 <sup>14</sup>
	Volume Resistivity, 300° C	D 1829	ohms-cm	4 x 10 <sup>10</sup>	5 x 10 <sup>12</sup>	3 x 10 <sup>12</sup>	1 x 10 <sup>11</sup>	8 x 10 <sup>11</sup>
	Volume Resistivity, 500° C	D 1829	ohms-cm	3 x 10 <sup>7</sup>	3 x 10 <sup>9</sup>	7 x 10 <sup>9</sup>	5 x 10 <sup>9</sup>	2 x 10 <sup>9</sup>
	Volume Resistivity, 700° C	D 1829	ohms-cm	2 x 10 <sup>6</sup>	3 x 10 <sup>8</sup>	4 x 10 <sup>8</sup>	4 x 10 <sup>8</sup>	2 x 10 <sup>8</sup>
Volume Resistivity, 1000° C	D 1829	ohms-cm	--	--	--	--	--	

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STC AL998 is NSF 51 certified as suitable for use in commercial food equipment. US Patent 8679995 Addition of Magnesium Oxide to Zirconia Toughened Alumina



			High Purity Alumina				
			AL995 99.5%	AL998 NSF51 Certified 99.8%	AL9980 99.8%	AL999 99.9%	
Property		ASTM Method	Units				
General	Crystal Size (Average)	Thin Section	Microns	6	6	6	2
	Color	--	--	Ivory-White	Ivory	Ivory	Off White/ Blush
	Gas Permeability	--	atms-cc/sec	gas tight <10 <sup>-10</sup>	gas tight <10 <sup>-10</sup>	gas tight <10 <sup>-10</sup>	gas tight <10 <sup>-10</sup>
	Water Absorption	C 20-97	%	0	0	0	0
Mechanical	Density	C 20-97	g/cc	3.88	3.91	3.91	3.93
	Hardness	Vickers 500 gm	GPa (kg/mm <sup>2</sup> )	14.3 (1459)	15 (1530)	15 (1530)	19.6 (2000)
	Hardness	--	R45N	82	86	86	90
	Fracture Toughness	Notched Beam	MPam <sup>1/2</sup>	4 - 5	3 - 4	3 - 4	5 - 6
	Flexural Strength (MOR) (3 point) @ RT°	F417-87	MPa (psi x 10 <sup>3</sup> )	338 (49)	379 (55)	379 (55)	455 (66)
	Tensile Strength @ RT°	--	MPa (psi x 10 <sup>3</sup> )	172 (25)	200 (29)	200 (29)	275 (40)
	Compressive Strength @ RT°	--	MPa (psi x 10 <sup>3</sup> )	2137 (310)	2240 (325)	2240 (325)	2413 (350)
	Elastic Modulus	C848	GPa (psi x 10 <sup>9</sup> )	379 (55)	379 (55)	379 (55)	393 (57)
	Poisson's Ratio	C848	--	0.23	0.23	0.23	0.23
Thermal	C.T.E. 25 - 100° C	C 372-96	x 10 <sup>-6</sup> /C	6.3	6.5	6.5	6.5
	C.T.E. 25 - 300° C	C 372-96	x 10 <sup>-6</sup> /C	6.9	7.9	7.9	7.9
	C.T.E. 25 - 600° C	C 372-96	x 10 <sup>-6</sup> /C	7.6	8.1	8.1	8.2
	Thermal Conductivity @ RT°	C 408	W/m K	30	30	30	35
	Max Use Temp (non-loading) (at high strength)	--	Fahrenheit (°F)	3047	3047	3047	3100
	--	Celsius (°C)	1675	1675	1675	1700	
Electrical	Dielectric Strength (.125" Thick)	D 149-97A	V/mil	270	290	290	422
	Dielectric Constant @ 1 MHz	D 150-98	--	9.8	9.8	9.8	9.9
	Dielectric Constant @ Gigahertz	D 2520-95	--	9.7	10	10	--
				9.8	9.6	9.6	--
	Dielectric Loss @ 1 MHz	D 150-98	--	0.0002	< .0001	< .0001	< .0001
	Dielectric Loss @ Gigahertz	D 2520-95	--	< .0001	< .0001	< .0001	--
				9.8	9.6	9.6	--
	Volume Resistivity, 25°C	D 257	ohms-cm	> 1 x 10 <sup>14</sup>	> 1 x 10 <sup>14</sup>	> 1 x 10 <sup>14</sup>	> 1 x 10 <sup>14</sup>
	Volume Resistivity, 300° C	D 1829	ohms-cm	1 x 10 <sup>12</sup>	3 x 10 <sup>12</sup>	3 x 10 <sup>12</sup>	1 x 10 <sup>13</sup>
	Volume Resistivity, 500° C	D 1829	ohms-cm	5 x 10 <sup>10</sup>	6 x 10 <sup>10</sup>	6 x 10 <sup>10</sup>	5 x 10 <sup>12</sup>
	Volume Resistivity, 700° C	D 1829	ohms-cm	2 x 10 <sup>9</sup>	6 x 10 <sup>9</sup>	6 x 10 <sup>9</sup>	1 x 10 <sup>12</sup>
Volume Resistivity, 1000° C	D 1829	ohms-cm	--	--	--	--	

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			Zirconia Toughened Alumina			
			ZTA-02 US Patent 8679995	ZTA-14	ZTA-20	
	Property	ASTM Method	Units			
General	Crystal Size (Average)	Thin Section	Microns	< 2	6	3
	Color	--	--	Off White	White	White
	Gas Permeability	--	atms-cc/sec	gas tight <10 <sup>-10</sup>	gas tight <10 <sup>-10</sup>	gas tight <10 <sup>-10</sup>
	Water Absorption	C 20-97	%	0	0	0
Mechanical	Density	C 20-97	g/cc	3.96	4.17	4.30
	Hardness	Vickers 500 gm	GPa (kg/mm <sup>2</sup> )	14 (1440)	14.5 (1478)	14.4 (1470)
	Hardness	--	R45N	81	82	82
	Fracture Toughness	Notched Beam	MPam <sup>1/2</sup>	5	6	6
	Flexural Strength (MOR) (3 point) @ RT°	F417-87	MPa (psi x 10 <sup>3</sup> )	448 (65)	586 (85)	621 (90)
	Tensile Strength @ RT°	--	MPa (psi x 10 <sup>3</sup> )	259 (38)	344 (50)	350 (51)
	Compressive Strength @ RT°	--	MPa (psi x 10 <sup>3</sup> )	2413 (350)	2758 (400)	2758 (400)
	Elastic Modulus	C848	GPa (psi x 10 <sup>6</sup> )	358 (52)	338 (49)	338 (49)
	Poisson's Ratio	C848	--	0.23	0.23	0.23
Thermal	C.T.E. 25 - 100° C	C 372-96	x 10 <sup>-6</sup> /C	6.7	6.0	6.0
	C.T.E. 25 - 300° C	C 372-96	x 10 <sup>-6</sup> /C	8.1	7.0	7.0
	C.T.E. 25 - 600° C	C 372-96	x 10 <sup>-6</sup> /C	8.3	7.1	7.1
	Thermal Conductivity @ RT°	C 408	W/m K	27	24	24
	Max Use Temp (non-loading) (at high strength)	--	Fahrenheit (°F)	2732	2730	2730
	--	Celsius (°C)	1500	1500	1500	
Electrical	Dielectric Strength (.125" Thick)	D 149-97A	V/mil	230	250	250
	Dielectric Constant @ 1 MHz	D 150-98	--	10.5	12.5	12.5
	Dielectric Constant @ Gigahertz	D 2520-95	--	--	--	12.4
	Dielectric Loss @ 1 MHz	D 150-98	--	0.0003	0.0006	0.0006
	Dielectric Loss @ Gigahertz	D 2520-95	--	--	0.0005	0.0005
	Volume Resistivity, 25°C	D 257	ohms-cm	> 1 x 10 <sup>14</sup>	> 1 x 10 <sup>14</sup>	> 1 x 10 <sup>14</sup>
	Volume Resistivity, 300° C	D 1829	ohms-cm	3 x 10 <sup>12</sup>	1 x 10 <sup>10</sup>	1 x 10 <sup>10</sup>
	Volume Resistivity, 500° C	D 1829	ohms-cm	6 x 10 <sup>10</sup>	2 x 10 <sup>9</sup>	2 x 10 <sup>9</sup>
	Volume Resistivity, 700° C	D 1829	ohms-cm	6 x 10 <sup>9</sup>	2 x 10 <sup>8</sup>	4 x 10 <sup>8</sup>
	Volume Resistivity, 1000° C	D 1829	ohms-cm	--	--	--

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			Zirconia					
			MSZ (Magnesia Stabilized) MSZ-200	MSZ (Magnesia Stabilized) MSZ-300	YTZP 2000 (Yttria Stabilized)	YTZP 4000 (Yttria Stabilized)	CSZ (Cerium Stabilized)	
			Property	ASTM Method	Units			
General	Crystal Size (Average)	Thin Section	Microns	30	30	1	1	3
	Color	--	--	Ivory	Yellow	Ivory	Ivory	Yellow
	Gas Permeability	--	atms-cc/sec	gas tight <10 <sup>-10</sup>	gas tight <10 <sup>-10</sup>	gas tight <10 <sup>-10</sup>	gas tight <10 <sup>-10</sup>	gas tight <10 <sup>-10</sup>
	Water Absorption	C 20-97	%	0	0	0	0	0
Mechanical	Density	C 20-97	g/cc	5.72	5.72	6.02	6.07	6.20
	Hardness	Vickers 500 gm	GPa (kg/mm <sup>2</sup> )	11.7 (1200)	11.7 (1200)	12.5 (1250)	12.5 (1250)	11.7 (1200)
	Hardness	--	R45N	78	78	80	80	78
	Fracture Toughness	Notched Beam	MPam <sup>1/2</sup>	12	12	10	10	12
	Flexural Strength (MOR) (3 point) @ RT°	F417-87	MPa (psi x 10 <sup>3</sup> )	620 (90)	586 (85)	951 (138)	1380 (200)	551 (80)
	Tensile Strength @ RT°	--	MPa (psi x 10 <sup>3</sup> )	310 (45)	310 (45)	550 (80)	690 (100)	337 (49)
	Compressive Strength @ RT°	--	MPa (psi x 10 <sup>3</sup> )	1862 (270)	1862 (270)	2485 (360)	2485 (360)	2000 (290)
	Elastic Modulus	C848	GPa (psi x 10 <sup>6</sup> )	206 (29.8)	206 (29.8)	210 (30)	210 (30)	200 (29)
	Poisson's Ratio	C848	--	0.28	0.28	0.30	0.30	0.25
Thermal	C.T.E. 25 - 100° C	C 372-96	x 10 <sup>-6</sup> /C	8.9	8.9	6.9	6.9	6.9
	C.T.E. 25 - 300° C	C 372-96	x 10 <sup>-6</sup> /C	9.7	9.7	8.1	8.1	8.1
	C.T.E. 25 - 600° C	C 372-96	x 10 <sup>-6</sup> /C	10.0	10.0	10.5	10.5	10.5
	Thermal Conductivity @ RT°	C 408	W/m K	3	3	2.2	2.2	3.5
	Max Use Temp (non-loading) (at high strength)	--	Fahrenheit (°F)	2200	2200	932	932	1000
	--	Celsius (°C)	1200	1200	500	500	537	
Electrical	Dielectric Strength (.125" Thick)	D 149-97A	V/mil	300	300	240	240	250
	Dielectric Constant @ 1 MHz	D 150-98	--	22.7	22.7	30.0	30.0	30.0
	Dielectric Constant	D 2520-95	--	29.2	29.2	--	--	--
	@ Gigahertz		--	6.2	6.2	--	--	--
	Dielectric Loss @ 1 MHz	D 150-98	--	0.0016	0.0016	0.0010	0.0010	0.0010
	Dielectric Loss	D 2520-95	--	0.0018	0.0018	--	--	--
	@ Gigahertz		--	6.2	6.2	--	--	--
	Volume Resistivity, 25°C	D 257	ohms-cm	> 1 x 10 <sup>13</sup>	> 1 x 10 <sup>13</sup>	> 1 x 10 <sup>13</sup>	> 1 x 10 <sup>13</sup>	> 1 x 10 <sup>13</sup>
	Volume Resistivity, 300° C	D 1829	ohms-cm	5 x 10 <sup>7</sup>	5 x 10 <sup>7</sup>	1 x 10 <sup>10</sup>	1 x 10 <sup>10</sup>	1 x 10 <sup>10</sup>
	Volume Resistivity, 500° C	D 1829	ohms-cm	1 x 10 <sup>7</sup>	1 x 10 <sup>7</sup>	1 x 10 <sup>6</sup>	1 x 10 <sup>6</sup>	1 x 10 <sup>6</sup>
	Volume Resistivity, 700° C	D 1829	ohms-cm	2 x 10 <sup>6</sup>	2 x 10 <sup>6</sup>	5 x 10 <sup>3</sup>	5 x 10 <sup>3</sup>	5 x 10 <sup>3</sup>
Volume Resistivity, 1000° C	D 1829	ohms-cm	--	--	--	--	--	

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	Property	ASTM Method	Units	Nitride		Carbide
				Aluminum Nitride (AlN)	Silicon Nitride (Si <sub>3</sub> N <sub>4</sub> )	Silicon Carbide (SiC) Alpha
General	Crystal Size (Average)	Thin Section	Microns	< 6	4	< 7
	Color	--	--	Gray	Black	Black
	Gas Permeability	--	atms-cc/sec	gas tight <10 <sup>-10</sup>	gas tight <10 <sup>-10</sup>	gas tight <10 <sup>-10</sup>
	Water Absorption	C 20-97	%	0	0	0
Mechanical	Density	C 20-97	g/cc	3.20	3.25	3.15
	Hardness	Vickers 500 gm	GPa (kg/mm <sup>2</sup> )	11.2 (1142)	15 (1529)	26 (2650)
	Hardness	--	R45N	79	83	> 90
	Fracture Toughness	Notched Beam	MPam <sup>1/2</sup>	3	6	4
	Flexural Strength (MOR) (3 point) @ RT	F417-87	MPa (psi x 10 <sup>3</sup> )	241 (35)	900 (130)	483 (70)
	Tensile Strength @ RT	--	MPa (psi x 10 <sup>3</sup> )	139 (20)	537 (78)	241 (35)
	Compressive Strength @ RT	--	MPa (psi x 10 <sup>3</sup> )	2100 (304)	2500 (362)	3306 (480)
	Elastic Modulus	C848	GPa (psi x 10 <sup>6</sup> )	310 (45)	300 (44)	448 (65)
	Poisson's Ratio	C848	--	0.24	0.28	0.17
Thermal	C.T.E. 25 - 100° C	C 372-96	x 10 <sup>-6</sup> /C	--	--	3.7
	C.T.E. 25 - 300° C	C 372-96	x 10 <sup>-6</sup> /C	4.3	--	--
	C.T.E. 25 - 600° C	C 372-96	x 10 <sup>-6</sup> /C	5.0	2.9	4.0
	Thermal Conductivity @ RT	C 408	W/m K	160	29	150
	Max Use Temp	--	Fahrenheit (°F)	2912	2552	2912
--		Celsius (°C)	1600	1400	1600	
Electrical	Dielectric Strength (.125" Thick)	D 149-97A	V/mil	355	300	--
	Dielectric Constant @ 1 MHz	D 150-98	--	8.6	9.2	10.2
	Dielectric Constant @ Gigahertz	D 2520-95	--	--	--	--
				--	--	--
	Dielectric Loss @ 1 MHz	D 150-98	--	0.0026	--	--
	Dielectric Loss @ Gigahertz	D 2520-95	--	--	--	--
				--	--	--
	Volume Resistivity, 25°C	D 257	ohms-cm	> 1 x 10 <sup>14</sup>	> 1 x 10 <sup>14</sup>	> 1 x 10 <sup>5</sup>
	Volume Resistivity, 300° C	D 1829	ohms-cm	--	--	1 x 10 <sup>4</sup>
	Volume Resistivity, 500° C	D 1829	ohms-cm	--	--	1 x 10 <sup>3</sup>
	Volume Resistivity, 700° C	D 1829	ohms-cm	--	--	--
Volume Resistivity, 1000° C	D 1829	ohms-cm	--	--	--	

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				Silicates					
		Property	ASTM Method	Units	Steatite L-4	Steatite L-5	Cordierite	Mullite	Lava Grade A Fired
General	Crystal Size (Average)	Thin Section	Microns	7	7	--	7	--	
	Color	--	--	Tan	Gray-Green	Orange-Tan	Gray-Tan	Gray-Tan	
	Gas Permeability	--	atms-cc/sec	--	--	Porous	--	Porous	
	Water Absorption	C 20-97	%	0	0	10	0	3	
Mechanical	Density	C 20-97	g/cc	2.65	2.75	2.00	3.00	2.30	
	Hardness	Vickers 500 gm	GPa (kg/mm <sup>2</sup> )	4.9 (500)	4.9 (500)	5.8 (590)	10 (1000)	4.4 (450)	
	Hardness	--	R45N	57	57	50	78	42	
	Fracture Toughness	Notched Beam	MPam <sup>1/2</sup>	--	--	--	3	--	
	Flexural Strength (MOR) (3 point) @ RT	F417-87	MPa (psi x 10 <sup>3</sup> )	117 (17)	138 (20)	66 (9.5)	206 (30)	69 (10)	
	Tensile Strength @ RT	--	MPa (psi x 10 <sup>3</sup> )	103 (15)	103 (15)	19 (2.7)	138 (20)	21 (3)	
	Compressive Strength @ RT	--	MPa (psi x 10 <sup>3</sup> )	551 (80)	586 (85)	165 (24)	1034 (150)	172 (25)	
	Elastic Modulus	C848	GPa (psi x 10 <sup>6</sup> )	103 (15)	103 (15)	103 (15)	179 (26)	--	
	Poisson's Ratio	C848	--	0.24	0.24	0.31	0.24	--	
Thermal	C.T.E. 25 - 100° C	C 372-96	x 10 <sup>-6</sup> /C	7.3	8.5	2.1	3.6	2.9	
	C.T.E. 25 - 300° C	C 372-96	x 10 <sup>-6</sup> /C	7.4	8.6	2.5	4.1	3.3	
	C.T.E. 25 - 600° C	C 372-96	x 10 <sup>-6</sup> /C	7.5	8.6	3.0	4.8	3.6	
	Thermal Conductivity @ RT	C 408	W/m K	3	3	3	4	2	
	Max Use Temp	--	Fahrenheit (°F)	2350	2350	2350	3100	2000	
	--	Celsius (°C)	1290	1290	1290	1700	1100		
Electrical	Dielectric Strength (.125" Thick)	D 149-97A	V/mil	260	270	120	250	100	
	Dielectric Constant @ 1 MHz	D 150-98	--	5.6	5.7	5.5	6.7	5.3	
	Dielectric Constant @ Gigahertz	D 2520-95	--	5.6	5.8	--	6.7	--	
	Dielectric Loss @ 1 MHz	D 150-98	--	0.003	0.0014	--	0.003	--	
	Dielectric Loss @ Gigahertz	D 2520-95	--	0.005	0.0017	--	0.003	--	
	Volume Resistivity, 25°C	D 257	ohms-cm	> 1 x 10 <sup>14</sup>	> 1 x 10 <sup>14</sup>	> 1 x 10 <sup>14</sup>	> 1 x 10 <sup>14</sup>	--	
	Volume Resistivity, 300° C	D 1829	ohms-cm	2 x 10 <sup>10</sup>	1 x 10 <sup>11</sup>	--	4 x 10 <sup>10</sup>	--	
	Volume Resistivity, 500° C	D 1829	ohms-cm	1 x 10 <sup>9</sup>	4 x 10 <sup>10</sup>	--	1 x 10 <sup>9</sup>	--	
	Volume Resistivity, 700° C	D 1829	ohms-cm	2 x 10 <sup>8</sup>	1 x 10 <sup>9</sup>	--	--	--	
	Volume Resistivity, 1000° C	D 1829	ohms-cm	--	--	--	--	--	

Note: The information in this data sheet is for design guidance only. STC does not warrant this data as absolute values. Forming methods and specific geometry could affect properties. Slight adjustments can be made to some of the properties to accommodate specific customer requirements. Most of the dense materials in the table are resistant to mechanical erosion and chemical attack. STC has performed ASTM testing qualification for certain compositions, in accordance with ASTM D2442. Please consult our technical staff for appropriate material and specific test results. Note: In addition to the above compositions, STC offers a wide range of alternative materials. Please contact one of our applications engineers for material requirements that may not be shown above.