

# EMISSIVITY CHART

Non-Metal and Metal Materials



## NON-METAL MATERIALS

Temp F° (C°)	Emissivity	Temp F° (C°)	Emissivity	Temp F° (C°)	Emissivity	Temp F° (C°)	Emissivity					
<b>Adobe</b>		<b>Cotton Cloth</b>		<b>Paints</b>		<b>Silica, Glazed</b>						
68 (20)	0.9	68 (20)	0.77	Blue, Cu2O3	75 (24)	0.94	1832 (1000)	0.85				
<b>Asbestos</b>		<b>Dolomite Lime</b>		Black, CuO	75 (24)	0.96	<b>Silica, Unglazed</b>					
Board	100 (38)	0.96	68 (20)	0.41	Green, Cu2O3	75 (24)	0.92	2012 (1100)	0.75			
Cement	32-392 (0-200)	0.96	<b>Emery Corundum</b>		Red, Fe2O3	75 (24)	0.91	<b>Silicon Carbide</b>				
Cement, Red	2500 (1371)	0.67	176 (80)	0.86	White, Al2O3	75 (24)	0.94	300-1200 (149-649)	.83-.96			
Cement, White	2500 (1371)	0.65	<b>Glass</b>		White, Y2O3	75 (24)	0.9	<b>Silk Cloth</b>				
Cloth	199 (93)	0.9	Convex D	212 (100)	0.8	White, ZnO	75 (24)	0.95	68 (20)	0.78		
Paper	100-700 (38-371)	0.93	Convex D	600 (316)	0.8	White, MgCO3	75 (24)	0.91	<b>Slate</b>			
Slate	68 (20)	0.97	Convex D	932 (500)	0.76	White, ZrO2	75 (24)	0.95	100 (38)	.67-.80		
Asphalt, pavement	100 (38)	0.93	Nonex	212 (100)	0.82	White, ThO2	75 (24)	0.9	<b>Snow, Fine Particles</b>			
Asphalt, tar paper	68 (20)	0.93	Nonex	600 (316)	0.82	White, MgO	75 (24)	0.91	20 (-7)	0.82		
<b>Basalt</b>		68 (20)	Nonex	932 (500)	0.78	White, PbCO3	75 (24)	0.93	<b>Snow, Granular</b>			
68 (20)	0.72	<b>Smooth</b>		32-200 (0-93)	.92-.94	Yellow, PbO	75 (24)	0.9	18 (-8)	0.89		
<b>Brick</b>		<b>Granite</b>		70 (21)	0.45	<b>Paints, Aluminium</b>		<b>Soil</b>				
Red, rough	70 (21)	0.93	<b>Gravel</b>		100 (38)	.27-.67	100 (38)	0.52	Surface	100 (38)	0.38	
Gault Cream	2500-5000 (1371-2760)	.26-.30	100 (38)	0.28	10% Al	100 (38)	0.52	Black Loam	68 (20)	0.66		
Fire Clay	2500 (1371)	0.75	<b>Gypsum</b>		26% Al	100 (38)	0.3	Plowed Field	68 (20)	0.38		
Light Buff	1000 (538)	0.8	68 (20)	.80-.90	Dow XP-310	200 (93)	0.22	<b>Soot</b>				
Lime Clay	2500 (1371)	0.43	<b>Ice, Smooth</b>		<b>Paints, Bronze</b>		Low	.34-.80	Acetylene	75 (24)	0.97	
Fire Brick	1832 (1000)	.75-.80	32 (0)	0.97	Gum Varnish (2 coats)	70 (21)	0.53	Camphor	75 (24)	0.94		
Magnesite, Refractory	1832 (1000)	0.38	<b>Ice, Rough</b>		Gum Varnish (3 coats)	70 (21)	0.5	Candle	250 (121)	0.95		
Grey Brick	2012 (1100)	0.75	32 (0)	0.98	Cellulose Binder (2 coats)	70 (21)	0.34	Coal	68 (20)	0.95		
Silica, Glazed	2000 (1093)	0.88	<b>Lacquer</b>		<b>Paints, Oil</b>		All colours	200 (93)	.92-.96	<b>Stonework</b>		
Silica, Unglazed	2000 (1093)	0.8	Black	200 (93)	0.96	Black	200 (93)	0.92	100 (38)	0.93		
Sandlime	2500-5000 (1371-2760)	.59-.63	Blue, on Al Foil	100 (38)	0.78	Black Gloss	70 (21)	0.9	<b>Water</b>			
<b>Carborundum</b>		1850 (1010)	0.92	Clear, on Al Foil (2 coats)	200 (93)	.08-.09	Camouflage Green	125 (52)	0.85	100 (38)	0.67	
<b>Ceramic</b>		<b>Lime Mortar</b>		Clear, on Bright Cu	200 (93)	0.66	Flat Black	80 (27)	0.88	<b>Waterglass</b>		
Alumina on Inconel	800-2000 (427-1093)	.69-.45	Clear, on Tarnished Cu	200 (93)	0.64	Flat White	80 (27)	0.91	68 (20)	0.96		
Earthenware, Glazed	70 (21)	0.9	Red, on Al Foil (2 coats)	100 (38)	.60-.74	Grey-Green	70 (21)	0.95	<b>Wood</b>			
Earthenware, Matte	70 (21)	0.93	White	200 (93)	0.95	Green	200 (93)	0.95	Low	.80-.90		
Greens No. 5210-2C	200-750 (93-399)	.89-.82	White, on Al Foil (2 coats)	100 (38)	.69-.88	Lamp Black	209 (98)	0.96	<b>Beech Planed</b>			
Coating No. C20A	200-750 (93-399)	.73-.67	Yellow, on Al Foil (2 coats)	100 (38)	.57-.79	Red	200 (93)	0.95	158 (70)	0.94		
Porcelain	72 (22)	0.92	<b>Limestone</b>		100-500 (38-260)	.90-.92	White	200 (93)	0.94	<b>Oak, Planed</b>		
White Al2O3	200 (93)	0.9	100 (38)	0.95	<b>Quartz, Rough, Fused</b>		70 (21)	0.93	100 (38)	0.91		
Zirconia on Inconel	800-2000 (427-1093)	.62-.45	<b>Marble, White</b>		Glass, 1.98 mm	540 (282)	0.9	Glass, 1.98 mm	1540 (838)	0.41		
<b>Clay</b>		<b>Mica</b>		Smooth, White	100 (38)	0.56	Glass, 6.88 mm	540 (282)	0.93	Glass, 6.88 mm	1540 (838)	0.47
68 (20)	0.39	100 (38)	0.75	Polished Grey	100 (38)	0.75	Opaque	570 (299)	0.92	Opaque	570 (299)	0.92
Fired	158 (70)	0.91	<b>Oil on Nickel</b>		<b>Red Lead</b>		Opaque	1540 (838)	0.68	<b>Rubber, Hard</b>		
Shale	68 (20)	0.69	0.001" Film	72 (22)	0.27	212 (100)	0.93	<b>Rubber, Soft, Grey</b>				
Tiles, Light Red	2500-5000 (1371-2760)	.32-.34	0.002" Film	72 (22)	0.46	<b>Rubber, Soft, Grey</b>		76 (24)	0.86			
Tiles, Red	2500-5000 (1371-2760)	.40-.51	0.005" Film	72 (22)	0.72	<b>Sand</b>		68 (20)	0.76			
Tiles, Dark Purple	2500-5000 (1371-2760)	0.78	Thick" Film	72 (22)	0.82	<b>Sandstone</b>		100 (38)	0.67			
<b>Concrete</b>		<b>Oil, Linseed</b>		On Al Foil, uncoated	250 (121)	0.09	<b>Sandstone, Red</b>		100 (38)	.60-.83		
Rough	32-2000 (0-1093)	0.94	On Al Foil, 1 coat	250 (121)	0.56	<b>Sawdust</b>		68 (20)	0.75			
Tiles, Natural	2500-5000 (1371-2760)	.63-.62	On Al Foil, 2 coats	250 (121)	0.51	<b>Shale</b>		68 (20)	0.69			
Brown	2500-5000 (1371-2760)	.87-.83	On Polished Iron, .001 Film	100 (38)	0.22							
Black	2500-5000 (1371-2760)	.94-.91	On Polished Iron, .002 Film	100 (38)	0.45							
			On Polished Iron, .004 Film	100 (38)	0.65							
			On Polished Iron, Thick Film	100 (38)	0.83							

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	Temp F° (C°)	Emissivity
<b>Alloys</b>		
20-Ni, 24-CR, 55-FE, Oxid.	392 (200)	0.9
20-Ni, 24-CR, 55-FE, Oxid.	932(500)	0.97
60-Ni, 12-CR, 28-FE, Oxid.	518 (270)	0.89
60-Ni, 12-CR, 28-FE, Oxid.	1040 (560)	0.82
80-Ni, 20-CR, Oxidised	212 (100)	0.87
80-Ni, 20-CR, Oxidised	1112 (600)	0.87
80-Ni, 20-CR, Oxidised	2372 (1300)	0.89
<b>Aluminium</b>		
Unoxidised	77 (25)	0.02
Unoxidised	212 (100)	0.03
Unoxidised	932 (500)	0.06
Oxidised	390 (199)	0.11
Oxidised	1110 (599)	0.19
Oxidised at 1110°F (599°C)	390 (199)	0.11
Oxidised at 1110°F (599°C)	1110 (599)	0.19
Heavily Oxidised	200 (93)	0.2
Heavily Oxidised	940 (504)	0.31
Highly Polished	212 (100)	0.09
Roughly Polished	212 (100)	0.18
Commercial Sheet	212 (100)	0.09
Highly Polished Plate	440 (227)	0.04
Highly Polished Plate	1070 (577)	0.06
Bright Rolled Plate	338 (170)	0.04
Bright Rolled Plate	932 (500)	0.05
Alloy A3003, Oxidised	600 (316)	0.4
Alloy A3003, Oxidised	900 (482)	0.4
Alloy 1100-0	200-800 (93-427)	0.05
Alloy 24ST	75 (24)	0.09
Alloy 24ST, Polished	75 (24)	0.09
Alloy 75ST	75 (24)	0.11
Alloy 75ST, Polished	75 (24)	0.08
<b>Bismuth, Bright</b>		
	176 (80)	0.34
<b>Bismuth, Unoxidised</b>		
	77 (25)	0.05
	212 (100)	0.06
<b>Brass</b>		
73% Cu, 27% Zn, Polished	476 (247)	0.03
73% Cu, 27% Zn, Polished	674 (357)	0.03
62% Cu, 37% Zn, Polished	494 (257)	0.03
62% Cu, 37% Zn, Polished	710 (377)	0.04
83% Cu, 17% Zn, Polished	530 (277)	0.03
Matte	68 (20)	0.07
Burnished to Brown Colour	68 (20)	0.4
Cu-Zn, Brass Oxidised	392 (200)	0.61
Cu-Zn, Brass Oxidised	752 (400)	0.6
Cu-Zn, Brass Oxidised	1112 (600)	0.61
Unoxidised	77 (25)	0.04
Unoxidised	212 (100)	0.04
Cadmium	77 (25)	0.02
<b>Carbon</b>		
Lampblack	77 (25)	0.95
Unoxidised	77 (25)	0.81
Unoxidised	212 (100)	0.81
Unoxidised	932 (500)	0.79
Candle Soot	250 (121)	0.95
Filament	500 (260)	0.95
Graphitized	212 (100)	0.76
Graphitized	572 (300)	0.75
Graphitized	932 (500)	0.71

	Temp F° (C°)	Emissivity
<b>Chromium</b>		
	100 (38)	0.08
	1000 (538)	0.26
<b>Chromium, Polished</b>		
	302 (150)	0.06
<b>Cobalt, Unoxidised</b>		
	932 (500)	0.13
	1832 (1000)	0.23
<b>Columbium, Unoxidised</b>		
	1500 (816)	0.19
	2000 (1093)	0.24
<b>Copper</b>		
Cuprous Oxide	100 (38)	0.87
Cuprous Oxide	500 (260)	0.83
Cuprous Oxide	1000 (538)	0.77
Black, Oxidised	100 (38)	0.78
Etched	100 (38)	0.09
Matte	100 (38)	0.22
Roughly Polished	100 (38)	0.07
Polished	100 (38)	0.03
Highly Polished	100 (38)	0.02
Rolled	100 (38)	0.64
Rough	100 (38)	0.74
Molten	1000 (538)	0.15
Molten	1970 (1077)	0.16
Molten	2230 (1221)	0.13
Nickel Plated	100-500 (38-260)	0.37
<b>Dow Metal</b>		
	0.4-600 (-18-316)	0.15
<b>Gold</b>		
Enamel	212 (100)	0.37
Plate on .0005 Silver	200-750 (93-399)	.11-.14
Plate on .0005 Nickel	200-750 (93-399)	.07-.09
Polished	100-500 (38-260)	0.02
Polished	1000-2000 (538-1093)	0.03
<b>Haynes Alloy C,</b>		
Oxidised	600-2000 (316-1093)	.90-.96
<b>Haynes Alloy 25,</b>		
Oxidised	600-2000 (316-1093)	.86-.89
<b>Haynes Alloy X,</b>		
Oxidised	600-2000 (316-1093)	.85-.88
<b>Inconel Sheet</b>		
	1000 (538)	0.28
	1200 (649)	0.42
	1400 (760)	0.58
<b>Inconel X, Polished</b>		
	75 (24)	0.19
<b>Inconel B, Polished</b>		
	75 (24)	0.21
<b>Iron</b>		
Oxidised	212 (100)	0.74
Oxidised	930 (499)	0.84
Oxidised	2190 (1199)	0.89
Unoxidised	212 (100)	0.05
Red Rust	77 (25)	0.7
Rusted	77 (25)	0.65
Liquid	2760-3220 (1516-1771)	.42-.45

	Temp F° (C°)	Emissivity
<b>Cast Iron</b>		
Oxidised	390 (199)	0.64
Oxidised	1110 (599)	0.78
Unoxidised	212 (100)	0.21
Strong Oxidation	40 (104)	0.95
Strong Oxidation	482 (250)	0.95
Liquid	2795 (1535)	0.29
<b>Wrought Iron</b>		
Dull	77 (25)	0.94
Dull	660 (349)	0.94
Smooth	100 (38)	0.35
Polished	100 (38)	0.28
<b>Lead</b>		
Polished	100-500 (38-260)	.06-.08
Rough	100 (38)	0.43
Oxidised	100 (38)	0.43
Oxidised at 1100	100 (38)	0.63
Gray Oxidised	100 (38)	0.28
<b>Magnesium</b>		
	100-500 (38-260)	.07-.13
<b>Magnesium Oxide</b>		
	1880-3140 (1027-1727)	.16-.20
<b>Mercury</b>		
	32 (0)	0.09
	77 (25)	0.1
	100 (38)	0.1
	212 (100)	0.12
<b>Molybdenum</b>		
	100 (38)	0.06
	500 (260)	0.08
	1000 (538)	0.11
	2000 (1093)	0.18
<b>Monel, Ni-Cu</b>		
	392 (200)	0.41
	752 (400)	0.44
	1112 (600)	0.46
<b>Monel, Ni-Cu Oxidised</b>		
	68 (20)	0.43
<b>Monel, Ni-Cu Oxid. at 1110degF</b>		
	1110 (599)	0.46
<b>Nickel</b>		
Polished	100 (38)	0.05
Oxidised	100-500 (38-260)	.31-.46
Unoxidised	77 (25)	0.05
Unoxidised	212 (100)	0.06
Unoxidised	932 (500)	0.12
Unoxidised	1832 (1000)	0.19
Electrolytic	100 (38)	0.04
Electrolytic	500 (260)	0.06
Electrolytic	1000 (538)	0.1
Electrolytic	2000 (1093)	0.16
<b>Nickel Oxide</b>		
	1000-2000 (538-1093)	.59-.86
<b>Palladium Plate (.0005 on .0005 silver)</b>		
	200-750 (93-399)	.16-.17
<b>Platinum</b>		
	100 (38)	0.05
	500 (260)	0.05
	1000 (538)	0.1

	Temp F° (C°)	Emissivity
<b>Platinum, Black</b>		
	100 (38)	0.93
	500 (260)	0.96
	2000 (1093)	0.97
<b>Platinum Oxidised at 1100</b>		
	500 (260)	0.07
	1000 (538)	0.11
<b>Rhodium Flash (0.0002 on 0.0005 Ni)</b>		
	200-700 (93-371)	.10-.18
<b>Silver</b>		
Plate (0.0005 on Ni)	200-700 (93-371)	.06-.07
Polished	100 (38)	0.01
Polished	500 (260)	0.02
Polished	1000 (538)	0.03
Polished	2000 (1093)	0.03
<b>Steel</b>		
Cold Rolled	200 (93)	.75-.85
Ground Sheet	1720-2010 (938-1099)	.55-.61
Polished Sheet	100 (38)	0.07
Polished Sheet	500 (260)	0.1
Polished Sheet	1000 (538)	0.14
Mild Steel, Polished	75 (24)	0.1
Mild Steel, Smooth	75 (24)	0.12
Mild Steel, liquid	2910-3270 (1599-1793)	0.28
Steel, Unoxidised	212 (100)	0.08
Steel, Oxidised	77 (25)	0.8
<b>Steel Alloys</b>		
Type 301, Polished	75 (24)	0.27
Type 301, Polished	450 (232)	0.57
Type 301, Polished	1740 (949)	0.55
Type 303, Oxidised	600-2000 (316-1093)	.74-.87
Type 310, Rolled	1500-2100 (816-1149)	.56-.81
Type 316, Polished	75 (24)	0.28
Type 316, Polished	450 (232)	0.57
Type 316, Polished	1740 (949)	0.66
Type 321	200-800 (93-427)	.27-.32
Type 321	300-1500 (149-815)	.18-.49
Type 321 w/BK Oxide	200-800 (93-427)	.66-.76
Type 347, Oxidised	600-2000 (316-1093)	.87-.91
Type 350	200-800 (93-427)	.18-.27
Type 350	300-1800 (149-982)	.11-.35
Type 446, Polished	300-1500 (149-815)	.15-.37
Type 17-7 PH	200-600 (93-316)	.44-.51
Type 17-7 PH	300-1500 (149-815)	.09-.16
Type C1020, Oxidised	600-2000 (316-1093)	.87-.91
Type PH-15-7 MO	300-1200 (149-649)	.07-.19

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	Temp F° (C°)	Emissivity
<b>Platinum, Black</b>		
	100 (38)	0.93
	500 (260)	0.96
	2000 (1093)	0.97
<b>Platinum Oxidised at 1100</b>		
	500 (260)	0.07
	1000 (538)	0.11
<b>Rhodium Flash (0.0002 on 0.0005 Ni)</b>		
	200-700 (93-371)	.10-.18
<b>Silver</b>		
Plate (0.0005 on Ni)	200-700 (93-371)	.06-.07
Polished	100 (38)	0.01
Polished	500 (260)	0.02
Polished	1000 (538)	0.03
Polished	2000 (1093)	0.03
<b>Steel</b>		
Cold Rolled	200 (93)	.75-.85
Ground Sheet	1720-2010 (938-1099)	.55-.61
Polished Sheet	100 (38)	0.07
Polished Sheet	500 (260)	0.1
Polished Sheet	1000 (538)	0.14
Mild Steel, Polished	75 (24)	0.1
Mild Steel, Smooth	75 (24)	0.12
Mild Steel, liquid	2910-3270 (1599-1793)	0.28
Steel, Unoxidised	212 (100)	0.08
Steel, Oxidised	77 (25)	0.8
<b>Steel Alloys</b>		
Type 301, Polished	75 (24)	0.27
Type 301, Polished	450 (232)	0.57
Type 301, Polished	1740 (949)	0.55
Type 303, Oxidised	600-2000 (316-1093)	.74-.87
Type 310, Rolled	1500-2100 (816-1149)	.56-.81
Type 316, Polished	75 (24)	0.28
Type 316, Polished	450 (232)	0.57
Type 316, Polished	1740 (949)	0.66
Type 321	200-800 (93-427)	.27-.32
Type 321 Polished	300-1500 (149-815)	.18-.49
Type 321 w/BK Oxide	200-800 (93-427)	.66-.76
Type 347, Oxidised	600-2000 (316-1093)	.87-.91
Type 350	200-800 (93-427)	.18-.27
Type 350, Polished	300-1800 (149-982)	.11-.35
Type 446, Polished	300-1500 (149-815)	.15-.37
Type 17-7 PH	200-600 (93-316)	.44-.51
Type 17-7 PH Polished	300-1500 (149-815)	.09-.16
Type C1020, Oxidised	600-2000 (316-1093)	.87-.91
Type PH-15-7 MO	300-1200 (149-649)	.07-.19

	Temp F° (C°)	Emissivity
<b>Stellite, Polished</b>		
	68 (20)	0.18
<b>Tantalum, Unoxidised</b>		
	1340 (727)	0.14
	2000 (1093)	0.19
	3600 (1982)	0.26
	5306 (2930)	0.3
<b>Tin, Unoxidised</b>		
	77 (25)	0.04
	212 (100)	0.05
<b>Tinned Iron, Bright</b>		
	76 (24)	0.05
	212 (100)	0.08
<b>Titanium</b>		
Alloy C110M, Polished	300-1200 (149-649)	.08-.19
Oxidised at 1000°F (538°C)	200-800 (93-427)	.51-.61
Alloy Ti-95A, Oxidised at 1000°F (538°C)	200-800 (93-427)	.35-.48
Anodized onto SS	200-600 (93-316)	.96-.82
<b>Tungsten</b>		
Unoxidised	77 (25)	0.02
Unoxidised	212 (100)	0.03
Unoxidised	932 (500)	0.07
Unoxidised	1832 (1000)	0.15
Unoxidised	2732 (1500)	0.23
Unoxidised	3632 (2000)	0.28
Filament (Aged)	100 (38)	0.03
Filament (Aged)	1000 (538)	0.11
Filament (Aged)	5000 (2760)	0.35
<b>Uranium Oxide</b>		
	1880 (1027)	0.79
<b>Zinc</b>		
Bright, Galvanised	100 (38)	0.23
Commercial 99.1%	500 (260)	0.05
Galvanised	100 (38)	0.28
Oxidised	500-1000 (260-538)	0.11
Polished	100 (38)	0.02
Polished	500 (260)	0.03
Polished	1000 (538)	0.04
Polished	2000 (1093)	0.06