

11 Emissivity tables

Material	Temp. °C	Temp. °F	λ	Emit.
Aluminum: anodized	20 °C	68 °F		0.770
Aluminum: anodized sheet, chromic acid process	100 °C	212 °F		0.55
Aluminum: disk, roughened	26 °C	79 °F	3 μm	0.275
Aluminum: disk, roughened	26 °C	79 °F	10 μm	0.180
Aluminum: foil	26 °C	79 °F	3 μm	0.09
Aluminum: foil	26 °C	79 °F	10 μm	0.04
Aluminum: foil, dull side, crinkled and smoothed	20 °C	68 °F		0.030
Aluminum: foil, shiny side	20 °C	68 °F		0.036
Aluminum: heavily weathered	17 °C	63 °F	2–5.6 μm	0.83–0.94
Aluminum: highly polished plate, 98.3 % pure	227 °C	441 °F		0.039
Aluminum: highly polished plate, 98.3 % pure	577 °C	1 071 °F		0.057
Aluminum: oxide, flame sprayed 0.001" thick	20 °C	68 °F		0.765
Aluminum: oxidized at 600	200 °C	392 °F		0.11
Aluminum: oxidized at 600	600 °C	1 112 °F		0.19
Aluminum: polished			8–14 μm	0.05
Aluminum: polished and degreased	20 °C	68 °F		0.027
Aluminum: polished plate	23 °C	73 °F		0.04
Aluminum: polished sheet	100 °C	212 °F		0.05
Aluminum: rough plate	26 °C	79 °F		0.055
Aluminum: rough surface			8–14 μm	0.07
Aluminum: sandblasted	20 °C	68 °F		0.210
Aluminum: sheet as received	100 °C	212 °F		0.09
Aluminum: strongly oxidized			8–14 μm	0.25
Aluminum: vacuum deposited	20 °C	68 °F		0.04
Asbestos: board	20 °C	68 °F		0.96
Asbestos: fabric	20 °C	68 °F		0.78
Asbestos: paper	400 °C	752 °F		0.93
Asbestos: slate	20 °C	68 °F		0.96
Brass: dull, tarnished			8–14 μm	0.22
Brass: highly polished	100 °C	212 °F		0.03
Brass: oxidized	100 °C	212 °F		0.61

Brass: polished			8–14 µm	0.10
Brass: rubbed with 80-grit emery	20 °C	68 °F		0.20
Brick: alumina	17 °C	63 °F	2–5.6 µm	0.68
Brick: common	17 °C	63 °F	2–5.6 µm	0.81–0.86
Brick: common, red	20 °C	68 °F		0.93
Brick: facing, red	20 °C	68 °F	2–5.6 µm	0.92
Brick: facing, yellow	20 °C	68 °F	2–5.6 µm	0.72
Brick: fireclay	20 °C	68 °F		0.85
Brick: fireclay	1 000 °C	1 832 °F		0.75
Brick: fireclay	1 200 °C	2 192 °F		0.59
Brick: masonry	0 °C	32 °F	5 µm	0.94
Brick: red				0.90
Brick: waterproof	17 °C	63 °F	2–5.6 µm	0.87
Bronze: polished				0.10
Bronze: porous, rough			8–14 µm	0.55
Carbon: candle soot	20 °C	68 °F		0.95
Carbon: graphite, filed surface	20 °C	68 °F		0.98
Carbon: purified			8–14 µm	0.80
Cement			8–14 µm	0.54
Charcoal: powder			8–14 µm	0.96
Chipboard: untreated	20 °C	68 °F	2–5.6 µm	0.90
Chromium: polished			8–14 µm	0.10
Clay: fired			8–14 µm	0.91
Concrete	20 °C	68 °F		0.92
Concrete: dry	36 °C	97 °F	5 µm	0.95
Concrete: rough	17 °C	63 °F	2–5.6 µm	0.92–0.97
Copper:, oxidized heavily	20 °C	68 °F		0.78
Copper: commercial., burnished			8–14 µm	0.07
Copper: electrolytic, polished			8–14 µm	0.02
Copper: oxidized to black			8–14 µm	0.88
Copper: polished	100 °C	212 °F		0.05
Copper: polished	20 °C	68 °F	3 µm	0.031
Copper: polished	20 °C	68 °F	10 µm	0.016
Copper: polished, annealed	20 °C	68 °F	10 µm	0.008

Enamel: lacquer			8–14 µm	0.90
Fabric: Hessian, green	20 °C	68 °F		0.88
Fabric: Hessian, uncolored	20 °C	68 °F	2–5.6 µm	0.87
Fiberglass	20 °C	68 °F		0.750
Fibre board: hard, untreated	20 °C	68 °F	2–5.6 µm	0.85
Fibre board: porous, untreated	20 °C	68 °F	2–5.6 µm	0.85
Filler: white	20 °C	68 °F	2–5.6 µm	0.88
Film thickness = 0.001	20 °C	68 °F		0.27
Film thickness = 0.002	20 °C	68 °F		0.46
Film thickness = 0.005	20 °C	68 °F		0.72
Firebrick	17 °C	63 °F	2–5.6 µm	0.68
Formica	27 °C	81 °F	6.5–20 µm	0.937
Glass			8–14 µm	0.92
Glass: chemical ware (partly transparent)	35 °C	95 °F	6.5–20 µm	0.97
Glass: frosted			8–14 µm	0.96
Glass: frosted	1 100 °C	2 012 °F		0.70
Glass: frosted	1 500 °C	2 732 °F		0.67
Glass: polished plate	20 °C	68 °F		0.94
Gold: highly polished	100 °C	212 °F		0.02
Gold: plated on stainless steel and polished	20 °C	68 °F		0.028
Gold: polished			8–14 µm	0.02
Granite: natural surface	36 °C	97 °F	5 µm	0.96
Graphite: powder			8–14 µm	0.97
Gravel			6.5–20 µm	0.28
Gypsum			8–14 µm	0.85
Hardwood: across grain	17 °C	63 °F	2–5.6 µm	0.82
Hardwood: along grain	17 °C	63 °F	2–5.6 µm	0.68–0.73
Ice			8–14 µm	0.97
Iron, cast, casing			8–14 µm	0.81
Iron: cast, oxidized	100 °C	212 °F		0.64
Iron: cast, polished	40 °C	104 °F	8–14 µm	0.21
Iron: heavily rusted	17 °C	63 °F	2–5.6 µm	0.91–0.96

Iron: hot rolled			8–14 μm	0.77
Iron: oxidized			8–14 μm	0.74
Iron: sheet, galvanized, burnished			8–14 μm	0.23
Iron: sheet, galvanized, oxidized			8–14 μm	0.28
Iron: sheet, heavily rusted	20 °C	68 °F		0.69
Iron: shiny, etched			8–14 μm	0.16
Iron: wrought, polished			8–14 μm	0.28
Lacquer: bakelite			8–14 μm	0.93
Lacquer: dull, black			8–14 μm	0.97
Lacquer: matte black	100 °C	212 °F		0.97
Lacquer: shiny, black, on metal				0.87
Lacquer: white			8–14 μm	0.87
Lacquer: white	100 °C	212 °F		0.92
Lampblack			8–14 μm	0.96
Lead: gray			8–14 μm	0.28
Lead: oxidized			8–14 μm	0.63
Lead: red, powder			8–14 μm	0.93
Lead: shiny			8–14 μm	0.08
Limestone: natural surface	36 °C	97 °F	5 μm	0.96
Magnesium: polished	20 °C	68 °F		0.07
Mercury: pure			8–14 μm	0.10
Mortar	17 °C	63 °F	2–5.6 μm	0.87
Mortar: dry	36 °C	97 °F	5 μm	0.94
Nickel base alone	20 °C	68 °F		0.05
Nickel: electroplated, no polish	20 °C	68 °F		0.11
Nickel: electroplated, polished	20 °C	68 °F		0.05
Nickel: on cast-iron			8–14 μm	0.05
Nickel: oxidized	200 °C	392 °F		0.37
Nickel: pure, polished			8–14 μm	0.05
Oil, lubricating (thin film on nickel base)				
P.V.C.	17 °C	63 °F	2–5.6 μm	0.91–0.93
Paint, oil: average of 16 colors	100 °C	212 °F		0.94
Paint: 3M, black velvet coating 9560 series optical blk	40 °C	104 °F	3 μm	@1.00

Paint: 3M, black velvet coating 9560 series optical blk	40 °C	104 °F	10 µm	@1.00
Paint: Acme, quality spray enamel, #801 brilliant blk	40 °C	104 °F	3 µm	0.959
Paint: Acme, quality spray enamel, #801 brilliant blk	40 °C	104 °F	10 µm	0.945
Paint: aluminum	20 °C	68 °F		0.450
Paint: Aquadag, 4 coats on copper aluminum	20 °C	68 °F		0.490
Paint: Broma, alkyd enamel #102, gold leaf	40 °C	104 °F	3 µm	0.98
Paint: Broma, alkyd enamel #102, gold leaf	40 °C	104 °F	10 µm	0.98
Paint: Broma, alkyd enamel #113, light blue	40 °C	104 °F	3 µm	0.95
Paint: Broma, alkyd enamel #113, light blue	40 °C	104 °F	10 µm	0.960
Paint: cadmium, yellow	20 °C	68 °F		0.33
Paint: Chromatone, stabilized silver finish (Alumaton)	25 °C	77 °F	3 µm	0.26
Paint: Chromatone, stabilized silver finish (Alumaton)	25 °C	77 °F	10 µm	0.305
Paint: chrome green	20 °C	68 °F		0.70
Paint: cobalt blue				
Paint: Dupont Duco #71 wrought iron black	40 °C	104 °F	3 µm	0.982
Paint: Dupont Duco #71 wrought iron black	40 °C	104 °F	10 µm	0.897
Paint: Dutch Boy, 46H47, National lead high heat blk	25 °C	77 °F	10 µm	0.90
Paint: Krylon, flat black	50 °C	122 °F	3 µm	0.95
Paint: Krylon, flat black	50 °C	122 °F	10 µm	0.956
Paint: Krylon, flat white #1502	40 °C	104 °F	3 µm	0.992
Paint: Krylon, flat white #1502	40 °C	104 °F	10 µm	0.989
Paint: Krylon, ultra flat black	36 °C	97 °F	5 µm	0.97
Paint: Microbond, 4 coats on magnesium	20 °C	68 °F		0.844
Paint: oil, black, flat	20 °C	68 °F	2–5.6 µm	0.94
Paint: oil, black, gloss	20 °C	68 °F	2–5.6 µm	0.92
Paint: oil, gray, flat	20 °C	68 °F	2–5.6 µm	0.97
Paint: oil, gray, gloss	20 °C	68 °F	2–5.6 µm	0.96
Paint: oil, various colors			8–14 µm	0.94
Paint: plastic, black	20 °C	68 °F	2–5.6 µm	0.95
Paint: plastic, white	20 °C	68 °F	2–5.6 µm	0.84

Paint: TiO ₂ , gray	20 °C	68 °F		0.870
Paint: TiO ₂ , white	20 °C	68 °F		0.940
Paper: black	20 °C	68 °F		0.90
Paper: black, dull	20 °C	68 °F		0.94
Paper: black, shiny			8–14 µm	0.90
Paper: cardboard box			5 µm	0.81
Paper: green	20 °C	68 °F		0.85
Paper: red	20 °C	68 °F		0.76
Paper: tar			8–14 µm	0.92
Paper: white	17 °C	63 °F	2–5.6 µm	0.68
Paper: white			8–14 µm	0.90
Paper: white bond	20 °C	68 °F		0.93
Paper: yellow	20 °C	68 °F		0.72
Pipes: glazed	17 °C	63 °F	2–5.6 µm	0.83
Plaster	17 °C	63 °F	2–5.6 µm	0.86–0.90
Plaster: rough coat	20 °C	68 °F		0.91
Plasterboard: untreated	20 °C	68 °F	2–5.6 µm	0.90
Plastic paper: red	20 °C	68 °F	2–5.6 µm	0.94
Plastic paper: white	20 °C	68 °F	2–5.6 µm	0.84
Plastic: acrylic, clear	36 °C	97 °F	5 µm	0.94
Plastic: black			2–5.6 µm	0.95
Plastic: white			2–5.6 µm	0.84
Platinum: pure, polished			8–14 µm	0.08
Plexiglass: Perspex	17 °C	63 °F	2–5.6 µm	0.86
Plywood	17 °C	63 °F	2–5.6 µm	0.83–0.98
Plywood: commercial, smooth finish, dry	36 °C	97 °F	5 µm	0.82
Plywood: untreated	20 °C	68 °F	2–5.6 µm	0.83
Polypropylene	17 °C	63 °F	2–5.6 µm	0.97
Porcelain: glazed			8–14 µm	0.92
Quartz			8–14 µm	0.93
Redwood : wrought, untreated	20 °C	68 °F	2–5.6 µm	0.83
Redwood: unwrought, untreated	20 °C	68 °F	2–5.6 µm	0.84
Rendering: gray	20 °C	68 °F	2–5.6 µm	0.92
Rokide A	20 °C	68 °F		0.770

Rubber			8–14 μm	0.95
Rubber: stopper, black	35 °C	95 °F	5 μm	0.97
Sand	20 °C	68 °F		0.90
Shellac: black, dull	100 °C	212 °F		0.91
Shellac: black, shiny, on tin plate	20 °C	68 °F		0.82
Shingles: asphalt, sm, ceramic coated				
Silver: polished	100 °C	212 °F		0.03
Skin, human	32 °C	90 °F		0.98
Snow			8–14 μm	0.80
Soil: dry	20 °C	68 °F		0.92
Soil: frozen			6.5– 20 μm	0.93
Soil: saturated with water	20 °C	68 °F		0.95
Stainless steel: type 18-8, buffed	20 °C	68 °F		0.16
Stainless steel: type 18-8, oxidized at 800	60 °C	140 °F		0.85
Stainless steel: type 18-8, sandblasted	20 °C	68 °F		0.440
Steel: galvanized			8–14 μm	0.28
Steel: oxidized	200 °C	392 °F		0.79
Steel: oxidized strongly			8–14 μm	0.88
Steel: polished	100 °C	212 °F		0.07
Steel: rolled freshly			8–14 μm	0.24
Steel: rough surface			8–14 μm	0.96
Steel: rusty, red			8–14 μm	0.69
Steel: sheet, nickel plated			8–14 μm	0.11
Steel: sheet, rolled			8–14 μm	0.56
Styrofoam: insulation	37 °C	99 °F	5 μm	0.60
Tape: electrical, insulating, black	35 °C	95 °F	5 μm	0.97
Tape: masking	36 °C	97 °F	5 μm	0.92
Thick coating	20 °C	68 °F		0.82
Tile: floor, asbestos	35 °C	95 °F	5 μm	0.94
Tile: glazed	17 °C	63 °F	2–5.6 μm	0.94
Tin: burnished			8–14 μm	0.05
Tin: commercial tin-plated sheet iron	100 °C	212 °F		0.07
Tungsten			8–14 μm	0.05

[11 – Emissivity tables]

Varnish: flat	20 °C	68 °F	2–5.6 µm	0.93
Wallpaper: slight pattern, light gray	20 °C	68 °F	2–5.6 µm	0.85
Wallpaper: slight pattern, red	20 °C	68 °F	2–5.6 µm	0.90
Water:			8–14 µm	0.98
Water: distilled	20 °C	68 °F		0.96
Water: frost crystals	-10 °C	14 °F		0.98
Water: ice, smooth	-10 °C	14 °F		0.96
Water: snow	-10 °C	14 °F		0.85
Wood: oak, planed	20 °C	68 °F		0.90
Wood: paneling, light finish	36 °C	97 °F	5 µm	0.87
Wood: planed			8–14 µm	0.85
Wood: spruce, polished, dry	36 °C	97 °F	5 µm	0.86
Zinc: sheet			8–14 µm	0.20