

## Descripción y tablas de Emisividad

La comprensión de la emisividad de un objeto, o su característica de "resplandor" o "brillo" es un componente crítico en el manejo apropiado de medición infrarroja. Concisamente, la emisividad es la relación de radiación emitida por una superficie o cuerpo negro. La teoría de la radiación consta desde la ley Planck's.  $[W(L,T)=C1/(L^5*(exp(C2/LT)-1))]$  la emisividad de la superficie de un material es medido por la cantidad de energía emitida cuando la superficie se observa directamente. Hay muchas variables que afectan la emisividad de un objeto específico, tal como la longitud de onda, el campo de visión, la forma geométrica y la temperatura. Sin embargo, para los propósitos y aplicaciones del usuario de termómetros infrarrojos, una mesa comprensiva que muestra la emisividad a temperaturas correspondientes de diversos superficies y objetos se muestra. Para una presentación más detallada y técnica de emisividad, por favor contacte directamente con Ampere. (salvarado@ampere.com.mx)

Materiales (No-Metálicos)	Temperatura ° C.	Emisividad
Adobe	20	0.9
<b>Asbestos</b>		
Board	38	0.96
Cemento	0-200	0.96
Cemento, Rojo	1371	0.67
Cemento, Blanco	1371	0.65
Cloth	93	0.9
Papel	38-371	0.93
Slate	20	0.97
Asfalto, pavimento	38	0.93
Asfalto, tar paper	20	0.93
Basalto	20	0.72
<b>Ladrillo</b>		
Rojo, rough	21	0.93
Gault Cream	1371-2760	.26-.30
Fire Clay	1371	0.75
Light Buff	538	0.8
Lime Clay	1371	0.43
Fire Brick	1000	.75-.80
Magnesite, Refractario	1000	0.38
Grey Brick	1100	0.75
Silica, Glazed	1093	0.88
Silica, Unglazed	1093	0.8
Sandlime	1371-2760	.59-.63
Carborundum	1010	0.92
<b>Ceramica</b>		
Alumina on Inconel	427-1093	.69-.45
Earthenware, Glazed	21	0.9
Earthenware, Matte	21	0.93
Greens No. 5210-2C	93-399)	.89-.82
Coating No. C20A	93-399	.73-.67
Porcelana	22	0.92
White Al2O3	93	0.9
Zirconia o Inconel	427-1093	.62-.45
<b>Clay</b>	20	<b>0.39</b>
Fired	70	0.91
Shale	20	0.69
Tiles, Light Red	1371-2760	.32-.34
Tiles, Red	1371-2760	.40-.51
Tiles, Dark Purple	1371-2760	0.78
<b>Concreto</b>		
Rough	0-1093	0.94
Tiles, Natural	1371-2760	.63-.62
Brown	1371-2760	.87-.83
Black	1371-2760	.94-.91
Cotton Cloth	20	0.77
Dolomite Lime	20	0.41

Materiales (Metálicos)	Temperatura ° C.	Emisividad
<b>Aleaciones</b>		
20-Ni, 24-CR, 55-FE, Oxid.	200	0.9
20-Ni, 24-CR, 55-FE, Oxid.	500	0.97
60-Ni, 12-CR, 28-FE, Oxid.	270	0.89
60-Ni, 12-CR, 28-FE, Oxid.	560	0.82
80-Ni, 20-CR, Oxidised	100	0.87
80-Ni, 20-CR, Oxidised	600	0.87
80-Ni, 20-CR, Oxidised	1300	0.89
<b>Aluminio</b>		
Unoxidised	25	0.02
Unoxidised	100	0.03
Unoxidised	500	0.06
Oxidised	199	0.11
Oxidised	599	0.19
Oxidised at 599degC(1110degF)	199	0.11
Oxidised at 599degC(1110degF)	599	0.19
Heavily Oxidised	93	0.2
Heavily Oxidised	504	0.31
Highly Polished	100	0.09
Roughly Polished	100	0.18
Commercial Sheet	100	0.09
Highly Polished Plate	227	0.04
Highly Polished Plate	577	0.06
Bright Rolled Plate	170	0.04
Bright Rolled Plate	500	0.05
Alloy A3003, Oxidised	316	0.4
Alloy A3003, Oxidised	482	0.4
Alloy 1100-0	93-427	0.05
Alloy 24ST	24	0.09
Alloy 24ST, Polished	24	0.09
Alloy 75ST	24	0.11
Alloy 75ST, Polished	24	0.08
Bismuth, Bright	80	0.34
Bismuth, Unoxidised	25	0.05
Bismuth, Unoxidised	100	0.06
<b>Latón</b>		
73% Cu, 27% Zn, Polished	247	0.03
73% Cu, 27% Zn, Polished	357	0.03
62% Cu, 37% Zn, Polished	257	0.03
62% Cu, 37% Zn, Polished	377	0.04
83% Cu, 17% Zn, Polished	277	0.03
Matte	20	0.07
Burnished to Brown Colour	20	0.4
Cu-Zn, Brass Oxidised	200	0.61
Cu-Zn, Brass Oxidised	400	0.6
Cu-Zn, Brass Oxidised	600	0.61
Unoxidised	25	0.04

Emery Corundum	80	0.86
<b>Vidrio</b>		
Convex D	100	0.8
Convex D	316	0.8
Convex D	500	0.76
Nonex	100	0.82
Nonex	316	0.82
Nonex	500	0.78
Smooth	0-93	.92-.94
Granite	21	0.45
Gravel	38	0.28
Gypsum	20	.80-.90
Ice, Smooth	0	0.97
Ice, Rough	0	0.98
<b>Laca</b>		
Black	93	0.96
Blue, on Al Foil	38	0.78
Clear, on Al Foil (2 coats)	93	.08-.09
Clear, on Bright Cu	93	0.66
Clear, on Tarnished Cu	93	0.64
Red, on Al Foil (2 coats)	38	.60-.74
White	93	0.95
White, on Al Foil (2 coats)	38	.69-.88
Yellow, on Al Foil (2 coats)	38	.57-.79
Lime Mortar	38-260	.90-.92
Limestone	38	0.95
Marble, White	38	0.95
Smooth, White	38	0.56
Polished Grey	38	0.75
Mica	38	0.75
<b>Oil on Nickel</b>		
0.001 Film	22	0.27
0.002 "	22	0.46
0.005 "	22	0.72
Thick "	22	0.82
<b>Aceite - Linaza</b>		
On Al Foil, uncoated	121	0.09
On Al Foil, 1 coat	121	0.56
On Al Foil, 2 coats	121	0.51
On Polished Iron, .001 Film	38	0.22
On Polished Iron, .002 Film	38	0.45
On Polished Iron, .004 Film	38	0.65
On Polished Iron, Thick Film	38	0.83
<b>Pinturas</b>		
Azul, Cu2O3	24	0.94
Negra, CuO	24	0.96
Verde, Cu2O3	24	0.92
Roja, Fe2O3	24	0.91
Blanca, Al2O3	24	0.94
Blanca, Y2O3	24	0.9
Blanca, ZnO	24	0.95
Blanca, MgCO3	24	0.91
Blanca, ZrO2	24	0.95
Blanca, ThO2	24	0.9
Blanca, MgO	24	0.91
Blanca, PbCO3	24	0.93
Amarilla, PbO	24	0.9
Amarilla, PbCrO4	24	0.93
<b>Pinturas base Aluminio</b>		
10% Al	38	0.52
26% Al	38	0.3
Dow XP-310	93	0.22

Unoxidised	100	0.04
Cadmium	25	0.02
<b>Carbón</b>		
Lampblack	25	0.95
Unoxidised	25	0.81
Unoxidised	100	0.81
Unoxidised	500	0.79
Candle Soot	121	0.95
Filament	260	0.95
Graphitized	100	0.76
Graphitized	300	0.75
Graphitized	500	0.71
Chromium	38	0.08
Chromium	538	0.26
Chromium, Polished	150	0.06
Cobalt, Unoxidised	500	0.13
Cobalt, Unoxidised	1000	0.23
Columbium, Unoxidised	816	0.19
Columbium, Unoxidised	1093	0.24
<b>Cobre</b>		
Cuprous Oxide	38	0.87
Cuprous Oxide	260	0.83
Cuprous Oxide	538	0.77
Black, Oxidised	38	0.78
Etched	38	0.09
Matte	38	0.22
Roughly Polished	38	0.07
Polished	38	0.03
Highly Polished	38	0.02
Rolled	38	0.64
Rough	38	0.74
Molten	538	0.15
Molten	1077	0.16
Molten	1221	0.13
Nickel Plated	38-260	0.37
Dow Metal	-18-316	0.15
<b>Oro</b>		
Enamel	100	0.37
Plate (.0001)	~	~
Plate on .0005 Silver	93-399	.11-.14
Plate on .0005 Nickel	93-399	.07-.09
Polished	38-260	0.02
Polished	538-1093	0.03
<b>Haynes Alloy C,</b>		
Oxidised	316-1093	.90-.96
<b>Haynes Alloy 25,</b>		
Oxidised	316-1093	.86-.89
<b>Haynes Alloy X,</b>		
Oxidised	316-1093	.85-.88
Inconel Sheet	538	0.28
Inconel Sheet	649	0.42
Inconel Sheet	760	0.58
Inconel X, Polished	24	0.19
Inconel B, Polished	24	0.21
<b>Iron</b>		
Oxidised	100	0.74
Oxidised	499	0.84
Oxidised	1199	0.89
Unoxidised	100	0.05
Red Rust	25	0.7
Rusted	25	0.65
Liquid	1516-1771	.42-.45

Paints, Bronze	Low	.34-.80
Gum Varnish (2 coats)	21	0.53
Gum Varnish (3 coats)	21	0.5
Cellulose Binder (2 coats)	21	0.34
<b>Pinturas de Aceite</b>		
Todos los Colores	93	.92-.96
Black	93	0.92
Black Gloss	21	0.9
Camouflage Green	52	0.85
Flat Black	27	0.88
Flat White	27	0.91
Grey-Green	21	0.95
Green	93	0.95
Lamp Black	98	0.96
Red	93	0.95
White	93	0.94
Quartz, Rough, Fused	21	0.93
Glass, 1.98 mm	282	0.9
Glass, 1.98 mm	838	0.41
Glass, 6.88 mm	282	0.93
Glass, 6.88 mm	838	0.47
Opaque	299	0.92
Opaque	838	0.68
Red Lead	100	0.93
Rubber, Hard	23	0.94
Rubber, Soft, Grey	24	0.86
Sand	20	0.76
Sandstone	38	0.67
Sandstone, Red	38	.60-.83
Sawdust	20	0.75
Shale	20	0.69
Silica, Glazed	1000	0.85
Silica, Unglazed	1100	0.75
Silicon Carbide	149-649	.83-.96
Silk Cloth	20	0.78
Slate	38	.67-.80
Snow, Fine Particles	-7	0.82
Snow, Granular	-7	0.89
<b>Soil</b>		
Surface	38	0.38
Black Loam	20	0.66
Plowed Field	20	0.38
<b>Hollín</b>		
Acetylene	24	0.97
Camphor	24	0.94
Candle	121	0.95
Coal	20	0.95
Stonework	38	0.93
Water	38	0.67
Waterglass	20	0.96
Wood	Low	.80-.90
Beech Planed	70	0.94
Oak, Planed	38	0.91
Spruce, Sanded	38	0.89

<b>Cast Iron</b>		
Oxidised	199	0.64
Oxidised	599	0.78
Unoxidised	100	0.21
Strong Oxidation	104	0.95
Strong Oxidation	250	0.95
Liquid	1535	0.29
<b>Hierro Forjado</b>		
Dull	25	0.94
Dull	349	0.94
Smooth	38	0.35
Polished	38	0.28
<b>Lead</b>		
Polished	38-260	.06-.08
Rough	38	0.43
Oxidised	38	0.43
Oxidised at 1100	38	0.63
Gray Oxidised	38	0.28
Magnesium	38-260	.07-.13
Magnesium Oxide	1027-1727	.16-.20
Mercury	0	0.09
Mercury	25	0.1
Mercury	38	0.1
Mercury	100	0.12
Molybdenum	38	0.06
Molybdenum	260	0.08
Molybdenum	538	0.11
Molybdenum	1093	0.18
Molybdenum Oxidised at 1000degF	316	0.8
Molybdenum Oxidised at 1000degF	371	0.84
Molybdenum Oxidised at 1000degF	427	0.84
Molybdenum Oxidised at 1000degF	482	0.83
Molybdenum Oxidised at 1000degF	538	0.82
Monel, Ni-Cu	200	0.41
Monel, Ni-Cu	400	0.44
Monel, Ni-Cu	600	0.46
Monel, Ni-Cu Oxidised	20	0.43
Monel, Ni-Cu Oxid. at 1110degF	599	0.46
<b>Nickel</b>		
Polished	38	0.05
Oxidised	38-260	.31-.46
Unoxidised	25	0.05
Unoxidised	100	0.06
Unoxidised	500	0.12
Unoxidised	1000	0.19
Electrolytic	38	0.04
Electrolytic	260	0.06
Electrolytic	538	0.1
Electrolytic	1093	0.16
Nickel Oxide	538-1093	.59-.86
Palladium Plate (.00005 on .0005 silver)	93-399	.16-.17
Platinum	38	0.05
Platinum	260	0.05
Platinum	538	0.1
Platinum, Black	38	0.93
Platinum, Black	260	0.96
Platinum, Black	1093	0.97
Platinum Oxidised at 1100	260	0.07
Platinum Oxidised at 1100	538	0.11
Rhodium Flash (0.0002 on 0.0005 Ni)	93-371	.10-.18
<b>Plata</b>		

Plate (0.0005 on Ni)	93-371	.06-.07
Polished	38	0.01
Polished	260	0.02
Polished	538	0.03
Polished	1093	0.03
<b>Acero</b>		
Cold Rolled	93	.75-.85
Ground Sheet	938-1099	.55-.61
Polished Sheet	38	0.07
Polished Sheet	260	0.1
Polished Sheet	538	0.14
Mild Steel, Polished	24	0.1
Mild Steel, Smooth	24	0.12
Mild Steel, liquid	1599-1793	0.28
Steel, Unoxidised	100	0.08
Steel, Oxidised	25	0.8
<b>Steel Alloys</b>		
Type 301, Polished	24	0.27
Type 301, Polished	232	0.57
Type 301, Polished	949	0.55
Type 303, Oxidised	316-1093	.74-.87
Type 310, Rolled	816-1149	.56-.81
Type 316, Polished	24	0.28
Type 316, Polished	232	0.57
Type 316, Polished	949	0.66
Type 321	93-427	.27-.32
Type 321 Polished	149-815	.18-.49
Type 321 w/BK Oxide	93-427	.66-.76
Type 347, Oxidised	316-1093	.87-.91
Type 350	93-427	.18-.27
Type 350 Polished	149-982	.11-.35
Type 446, Polished	149-815	.15-.37
Type 17-7 PH	93-316	.44-.51
Type 17-7 PH Polished	149-815	.09-.16
Type C1020, Oxidised	316-1093	.87-.91
Type PH-15-7 MO	149-649	.07-.19
Stellite, Polished	20	0.18
Tantalum, Unoxidised	727	0.14
Tantalum, Unoxidised	1093	0.19
Tantalum, Unoxidised	1982	0.26
Tantalum, Unoxidised	2930	0.3
Tin, Unoxidised	25	0.04
Tin, Unoxidised	100	0.05
Tinned Iron, Bright	24	0.05
Tinned Iron, Bright	100	0.08
<b>Titanio</b>		
Alloy C110M, Polished	149-649	.08-.19
Oxidised at 538degC	93-427	.51-.61
Alloy Ti-95A, Oxidised at 538degC	93-427	.35-.48
Anodized onto SS	93-316	.96-.82
<b>Tungsteno</b>		
Unoxidised	25	0.02
Unoxidised	100	0.03
Unoxidised	500	0.07
Unoxidised	1000	0.15
Unoxidised	1500	0.23
Unoxidised	2000	0.28
Filament (Aged)	38	0.03
Filament (Aged)	538	0.11
Filament (Aged)	2760	0.35
Uranium Oxide	1027	0.79
<b>Zinc</b>		

Bright, Galvanised	38	0.23
Commercial 99.1%	260	0.05
Galvanised	38	0.28
Oxidised	260-538	0.11
Polished	38	0.02
Polished	260	0.03
Polished	538	0.04
Polished	1093	0.06