Index

A
Absorptance, 6
Absorption coefficient, 7
Absorption spectra
  Furnace gases, 103
Aerial scanning, 94
Apparent emissivity of cavities, 57
Applications of radiation thermometers
  Aerial scanning, 94
  Glass pressing, 67
  Plastics and paper processing, 74
  Roof-moisture detection, 95
  Semiconductor industry, 96
  Steel industry, 96, 121
  Welding, 95, 115
Applications, selection for, 65
ASTM Committee E20.02, 163
Atmospheric effects
  Absorption and emission, 14
  Furnace gases, 103
  Water vapor absorption, 14, 53
  Windows, 14

B
Blackbody radiation, 4
  Planck’s law, 4, 155
  Wien’s law, 19
Blackbody simulators, 43, 57, 112
  Fiber-optic tip, 154
  Fixed-point furnaces, 45

C
Contact-type thermometers (see also Thermocouples), 130, 131
  Complementarity of emissivity and reflectance, 12
  Crystal growing, 80
  Calibration
    Equipment, 25, 54
    Industrial thermometers, 39, 164
    Information system, 25, 30
    Laboratories, 24
    Methods, 39
  Calibration, effects on, 51, 52, 53
  Calibration of
    Fiber-optic thermometer, 153
    Narrow-band thermometers, 50
    On-line verification, 112, 147, 165
    Optical pyrometer, 28, 36
    Procedures, 28, 34, 36, 153
    Traceability, 30, 40, 122
    Wide-band thermometer, 29

D
Dual thermometer systems, 66, 103, 105, 108
Dual-wavelength radiation thermometer (see Ratio thermometer)

E
Effective wavelength, 18
Education of the user, 163
Emissivity
  Definition, 6
  Electronic chip, 97
  Materials, 72, 127, 128, 130
  Measurement methods, 127, 136, 165
Emissivity effects, 72, 97, 122
  Correction for, 21
Emissivity of cavities, 57, 112
Extinction coefficient, 9

F
Fiber optics, 64, 151
Fiber-optic thermometer, 152
Fresnel relations, 9
Furnaces
  Blackbody simulators, 42
  Fixed-point, 45
  Steel annealing, 123
  Steel reheat, 99

G
Gold-cup pyrometer, 165
Glass pressing, 67

H
Humidity effects, 53
Hybrid thermometer systems, 66, 124–125

I
Index of refraction, 9
Infrared heaters, 75
Infrared thermography, 86
In-furnace temperature measurement, 99, 123
Interchangeability, 57
International Practical Temperature Scale, 41

K
Kirchhoff’s law, 7, 13

L
Lagrange invariant, 18
Line scanner, 87

M
Measurement equation, 17

N
National Bureau of Standards
  Strip-lamp calibration, 36
  Traceability, 30, 32
National (primary) laboratories, 30, 41, 122
National standards, 30, 41
Nondestructive inspection, 95

O
Optical constants (see Index of refraction, Extinction coefficient)
  Table of values, 11
Optical pyrometer, 28, 34, 65

P
Paper processing, 74
Photodetectors, 19, 92
  Detectivity, 20
  Pyroelectric, 93
  Silicon, 49, 72, 153
Planck’s law (see Blackbody radiation)
Plastic processing, 74
Polarization, 9
Polypropylene film, 77
Portable radiation thermometers, 64, 87
Primary standards, 24, 40, 42
Pyroelectric vidicon, 93

R
Radiance, 4
Radiometer, 3, 123
Radiation sources, 26, 42, 43, 75
Radiation thermometer, 3, 39
  Infrared (4.3 μm), 76
  Selection, 49, 75, 103
Silicon photodiode, 49, 72, 153
  Types of, 65
Radiation thermometry (the field of)
  Literature, 163
  Research priorities, 122, 166
  Status and trends, 63
  Technology, 163
Raster scanner, 89
Ratio radiation thermometer, 21, 65, 84, 117, 153
Reflectance, 6
Reflection effects, 14, 101, 123
  Cavities, 147
  Specularity, 137
Repeatability, 57
Reproducibility, 57
Research priorities, 122, 166
Resistance-heating (high-frequency), 115

S
Sapphire (fiber-optics) thermometer, 151
  Secondary standard, 26, 40, 43
  Semitransparent material effects, 75
Silicon, 80
Standardization activities, 165–167
Steel industry processes
  Annealing furnace, 123
  Reheat furnace, 99
Stray radiation (see Reflection effects)
Strip lamps, 26, 36, 47
Surface roughness, 8

T
  Target size effects, 51, 115
  Temperature control, 64, 69, 74, 82, 115
  Thermal radiative properties (see Emissivity, Absorptance, Reflectance)
    Dielectric behavior, 12
  Thermocouples, 110, 165
  Thermoforming, 74
  Thermal imaging, 86, 96
  Total radiation thermometers, 65
  Traceability (see Calibration)
  Transmission spectra
    Atmosphere, 53
    Infrared window materials, 18
    Polypropylene film, 77
  Two-color pyrometer (see Ratio radiation thermometer)

U
  Uncertainty, measurement, 56

V
  Verification methods, 112, 147, 165

W
  Welding, 95, 115
  Wien’s law (see Blackbody radiation)
  Window effects, 16, 31
  Window materials, 18