

Index

α -crystallin, 55
2'7'-dichlorofluorescin diacetate (DCFDA), 357

A

absorbing particles, 342, 362
absorption, 169, 495
absorption coefficient, 105, 336, 715
acousto-optic tunable filter (AOTF), 427
adding-doubling method, 188
adenosine triphosphate (ATP), 586
agar, 338, 355
amplitude-scattering matrix, 26
anisotropy factor, 13, 282, 345
anomalous-diffraction (AD)
 approximation, 21
anterior prefrontal cortex (APFC), 566
approximation of solid spheres, 59
astrocytes, 539
autofluorescence, 372

B

back-scattering Mueller matrix, 92
ballistic photon, 423
basal membrane, 373
basic fuchsine, 356
Beer–Lambert law, 10, 410
binary mixture, 350
biological tissues, 45
birefringence, 70

blood, 161
hematocrit, 70
optical properties, 162
plasma, 116
pressure, 696
volume, 50
blood-brain barrier disruption (BBBD), 707
blood oxygen level-dependent (BOLD) contrast, 689
Boltzmann transport equation (BTE), 484
Bose–Einstein function, 379
Bouguer's law, 10

C

Carmine–E120, 356
central nervous system (CNS), 707
cerebral blood flow (CBF), 637, 688, 696
cerebral blood volume (CBV), 639
cerebrospinal fluid (CSF), 373, 506
cervix uteri, 337
Chlorophyll–E140, 356
circular intensity differential scattering (CIDS), 101
cognitive conflict control, 560
coherence properties, 378
collagenous fibril, 52
complex architecture, 337
constant-fraction discriminator (CFD), 429
continuous wave (CW), 221
cornea, 51

coupled plasmon resonances, 41
cytochrome, 591, 702

D

deoxyhemoglobin, 689
depolarization criterion, 95
depolarization length, 89
depth-resolved coherence imaging, 447
dermis, 714
dichroism, 49
diffuse correlation spectroscopy (DCS), 502
diffuse optical tomography, 509, 539
diffuse reflectance imaging, 418
diffuse signal, 423
diffuse transmittance, 410, 441
diffusing-wave spectroscopy (DWS), 284
diffusion approximation (DA), 74, 247, 292
diffusion equation (DE), 109, 485
discrete dipole approximation (DDA), 17
discrete ordinate method, 234
discrete tissue models, 47
dispersion equation, 7
dispersion media, 9
dispersion relation, 68
distributed-source approach (DSA), 235
distribution of times of flight of photons (DTOF), 420, 428
Drude theory, 33
dyes, 337

dynamic phantoms, 369
dynamic speckle pattern, 284

E

epoxy resin, 354
erythrocyte, 47, 164
concentrate, 374
suspension, 364
European Sunset (E110), 356
Evans blue, 352
Ewald–Oseen extinction theorem, 7
extinction coefficient, 171
extinction matrix, 13
extrapolated boundary conditions (EBCs), 490

F

fat emulsions, 343
finite difference time domain method (FDTD), 22
finite element method (FEM), 22, 415, 648
first-order approximation, 75
flux theory, 76
foams, 340
form birefringence, 71
four-flux model, 76
Fractal aggregates, 28
fractal cluster optics, 31
fractal structure, 56
frequency-domain (FD) technique, 225
frequency-domain spectroscopy, 477
front surface transducer (FST), 741
functional near-infrared imager (fNIRI), 537

functional near-infrared spectroscopy (fNIRS), 448

G

Gegenbauer kernel phase function (GKPF), 179
gelatin, 338, 348
generalized Mie theory, 24
glucose concentration monitoring, 108
gold nanoparticle, 372
graded-index (GRIN) fiber, 437
graphite powder, 362
Green's function, 16, 246, 293

H

hematocrit, 181, 370
hemoglobin, 161, 361, 588, 591
Henyey–Greenstein phase function (HGPF), 91, 179, 751
heterodyne detection, 480
hexagonal quasi-crystal, 52
high-intensity focused ultrasound (HIFU), 737
hollow microspheres, 351
homodyne detection, 480
host material, 338
human breast phantom, 366
hyperspectral fNIRS, 701

I

in vivo flow cytometry, 35
India ink, 359
indocyanine green (ICG), 352, 453
infrared dye, 354
integral equation method (IEM), 16

interaction matrix, 25
inverse problem, 45
iron particles, 363
isotropic scattering, 13

K

Kiton Red 620, 357
Kubelka–Munk model, 76

L

laser-induced pressure (LIP), 739
leukocyte, 47, 166
light guide, 435
light scattering matrix (LSM), 62
linear birefringence, 49
lipids, 593
liquid phantoms, 338
local estimate technique, 242
Lorentz–Lorenz formula, 7

M

magnetic resonance encephalography (MREG), 690
mean field theory (MFT), 29
metal nanorods (NRs), 35
metal nanoshells, 37
methemoglobin, 368
methylene blue, 352
microscopic Beer–Lambert law, 607
microscopy stains, 352
middle cerebral arteries (MCAs), 697
Mie coefficients, 14, 25
Mie resonance, 275
Mie theory, 14, 173, 339

milk, 347
 mineral particles, 349
 mixing rule, 7
 mode locking, 424, 425
 monodisperse systems, 59
 Monte Carlo (MC) simulation, 78, 744
 Monte Carlo method, 186, 236, 406
 Monte Carlo model, 647
 in multi-voxeled tissues (MCMV), 542
 Mossotti–Clausius (or Maxwell Garnett) mixture formulas, 11
 Mueller scattering matrix, 13
 multidistance tissue spectroscopy, 493
 multilayered head tissue structure, 710
 multimodal measurements, 688
 multiple scattering, 87
 multiple wave scattering theory (MWST), 5
 myoglobin, 592

N

near-infrared (NIR) light, 402
 near-infrared spectroscopy (NIRS), 585, 590
 neonatal brain, 374
 noninvasive hemoglobin spectroscopy, 590
 numerical aperture (NA), 436

O

optical activity, 101
 optical clearing, 108

optical clearing agent (OCA), 108, 693
 optical spectroscopy, 587
 optical thickness, 85
 optical transmittance, 710
 optically active phantoms, 376
 optically soft particles, 66
 optoacoustic front-surface transducer (OAFST), 764
 oxygen saturation, 168
 oxygenation, 206
 oxyhemoglobin, 693

P

partial least squares (PLS), 616
 partially permeable membrane, 109
 particle-scattering theory, 5
 Percus–Yevick approximation, 11
 phase function, 72
 phase matrix, 77
 phosphate-buffered saline, 352
 photomultiplier tube (PMT), 285, 431, 480
 photon density, 293, 485, 508
 photon fluence rate, 485
 photon flux, 485
 photon migration, 494, 540
 photon weighting, 241
 photon-density wave, 112
 photon-number distributions, 378
 pigment, 370
 plasmon resonance (PR), 32
 plasmon-resonant particles, 32
 platelets, 166
 Pockels cell, 478
 Poincaré sphere, 120

Poisson function, 379
polarization anisotropy, 69
polarization degree mapping, 90
polarization imaging, 90
poly-methyl methacrylate (PMMA), 741
polystyrene latex spheres, 348
polyvinyl alcohol (PVA-C), 338
potassium chromate, 357
prefrontal cortex (PFC), 536
proflavine, 356
pulsed photothermal radiometry (PPTR), 739

Q

quantum dots, 364

R

radial distribution function, 53
radiation transfer equation (RTE), 4
radiation transfer theory (RTT), 4
Rayleigh approximation, 18
Rayleigh limit, 11
Rayleigh–Debye–Gans (RDG) method, 16, 19
red blood cells (RBCs), 161, 370
refractive index, 49
retinal nerve fiber layer, 47
Rhodamine 6G (R6G), 365

S

scalp, 712
scatterers, 338
scattering, 169, 496
scattering amplitude, 13
scattering coefficient, 346, 713

scattering phase function, 169, 337
scattering spectra, 67
scattering theory, 6
Schrödinger equation, 273
sclera, 51
Siebert formula, 281
silicone, 338
silicone elastomer, 371
single-particle extinction, 36
single-photon avalanche diode (SPAD), 432
single-scattering approximation, 59
single-scattering delay time, 259
small-angle scattering, 11
small-angular approximation, 75
solid phantoms, 338
spatial ordering, 50
spatially resolved spectroscopy (SRS), 599
spherical harmonics, 233
squamous epithelium, 373
stimulated emission, 377
Stokes parameters, 13
Stokes rotation matrix, 77
streak camera, 433
structure factor, 60
Sugeno Fuzzy Inference System (SFIS), 616
superluminescent diode (SLD), 286

T

T-matrix methods, 14
temporal point spread function (TPSF), 428, 537

- time-correlated single photon counting (TCSPC), 427, 428, 537
time-dependent mean partial path length (TMPP), 420
time-dependent transport theory (TTT), 226
time-domain (TD) technique, 223
time-resolved imaging, 408, 411
time-resolved optical tomography, 443
time-resolved spectroscopy (TRS), 603
time-to-amplitude converter (TAC), 430, 610
time-to-digital converter (TDC), 430
tissue phantoms, 336
tissue-like phantom, 336, 369
transcranial Doppler (TCD), 696
transit time spread (TTS), 430
triphenylmethane dye, 370
trypan blue, 353
two-flux Kubelka–Munk theory, 76
two-layer phantoms, 362
two-layered medium, 491

V

- vector radiative transfer equation, 76
volume fraction, 10, 50

W

- water, 720
Wentzel–Kramers–Brillouin (WKB) approximation, 21