

Index

A

Acesulfame (ACE), 381, 382
Acesulfame K (ACE-K), 381
Acetic acid, 45, 159, 323, 326–330, 334, 371
Acid Blue 92, 118
Acid Orange 7 (AO7), 126, 157, 162, 208–225, 304, 327, 356
Acid Orange II, 19, 50
Acid Red 14, 118
Acid Red 88, 319, 327
Acid Red 151, 327, 357
Acid Yellow 9, 319, 327
Acid Yellow 36 (AY36), 120, 249, 327
Acid Yellow 42, 165, 330
Activated carbon fiber (ACF), 7, 76, 113, 132
Adsorption, 21, 51, 76, 85, 106, 164, 241, 349, 359, 404
Advanced oxidation processes (AOPs), 3, 29, 32, 85, 207, 209, 219, 255, 263, 380
Aerobic biological treatment (ABT), 36
Alginate, 19, 85, 99–103, 107, 161
Alizarin Red S (AR), 157, 210
Allura Red AC, 327
Ametryn, 319, 324–326
4-Amino-3-hydroxy-2-p-tolylazo-naphthalene-1-sulfonic acid (AHPS), 94, 160
Aniline, 153, 209, 215, 216, 243
Anthraquinone, 6, 59, 157, 210
Anthraquinone-2,6-disulfonate/polypyrrole (AQDS/PPy), 159
Anthraquinone monosulfonate (AQS), 128
Aromatics, 21, 44, 65, 70, 316, 329, 413
Arsenic, 353, 358

Arsenic(V), 353
Arsenic(III), oxidation, 50
Artificial neural networks (ANN), 302
Artificial sweeteners, 379, 381
Aspartame (ASP), 381
Aspirine, 268
Atrazine, 60
Autonomous solar flow plant, 332
Average oxidation state (AOS), 33

B

Basic Yellow 2, 116, 303
Benzene, 2, 68, 289–291
Benzene sulfonic acid, 265 2
 ρ -Benzoquinone, 331
Beta-blockers, 31, 38, 208, 331
Bicarbonate, 349
Bioassays, 399, 415
Biodegradability, 29, 33, 60, 355, 399, 415
 indicators, 33
Bio-electro-Fenton (Bio-EF), 29, 36
Biological treatment, 29
Bioluminescence-based toxicity test, 33, 97, 393, 415
Bisphenol A (BPA), 130, 157, 295, 351
Boron-doped diamond (BDD), 7, 34, 70, 113, 207, 264, 268, 316, 345, 380, 404
Bray-Gorin mechanism, 289, 290, 297, 300, 304
Brilliant Red X3B (X3B), 132
Bromate, 60, 62, 67
Bromide, 60, 62, 67
tert-Butylhydroquinone, 101

C

Caffeic acid, 338
 Caffeine, 39, 44
 Carbamazepine, 31
 Carbaryl, 210
 Carbon, 85
 cathode, unmodified, 287
 felt, 113, 145, 156, 159
 fiber, 113, 146, 176, 207, 219, 246
 iron-loaded, 101
 mesoporous, 111, 130
 nanomaterials, 111
 sponge, 7, 15, 113, 147, 176, 380, 404
 Carbon nanotubes (CNTs), 7, 50, 111–115, 152, 176, 246
 boron-doped (B-CNTs), 246
 multiwalled (MWCNTs), 8, 115, 152
 single-walled (SWCNTs), 115, 152
 Carboxylic acids, 6, 21, 32, 37, 45, 70, 86, 97, 159, 226, 313–339, 351, 379, 390, 413
 Carmoisine, 22
 Catalysts, concentration, 408
 iron, 18
 solid, 85
 Catechol, 216, 331
 CCB-470, 247
 Cell potential, 222, 229, 269
 CF-1371, 246
 CF-1410, 246
 Chalcopyrite, 161
 Chemical oxygen demand (COD), 33, 157, 276, 338, 415
 Chloramphenicol, 165, 209, 331
 Chloride, 5, 21, 80, 328, 373
 Chlorine, 21–24, 67, 80, 373
 Chlorobenzene, 68, 69, 73, 208
p-Chlorobenzoic acid (*p*-CBA), 65, 66
 4-Chloro-2-methylphenol, 157, 326
 4-Chloro-2-methylphenoxyacetic acid (MCPA), 249, 319, 325
 Chlorophene, 159
 Chlorophenols, 208
 Chlorophenoxy acid, 157, 209
 Chlorpyrifos, 102
 Chlortoluron, 157, 302
 Citric acid, 100, 330
 Clay minerals, 413
 Clofibrac acid, 265
 CoFe-layered double hydroxide (CoFe-LDH), 161
 Combined process, 29

Conductivity, 7, 37, 113, 145, 175, 191, 241, 350, 355
 Congo Red, 326–328
 Copper, 2, 92
p-Coumaric acid (4-hydroxycinnamic acid), 157
 Coupled process, 241
 Coupled solar-assisted electro-fenton treatments, 334
 CPC photoreactor, 281, 313, 330, 356
 Cresols, 101, 106, 216, 319, 322
 Crystal violet, 157
 Current density, 8, 18, 63, 151, 219, 241, 406
 Current distribution, 263, 271, 281
 Cyanides, 3, 356
 Cyclodextrins, 399, 404, 410–412, 415

D

2,4-D, 101, 107, 124, 157, 351
 Decolorization, kinetic model, 287
 Degradation kinetics, 1, 16, 70, 93, 404
 2,4-Dichlorophenol, 101, 107, 124, 157, 351
 Diclofenac, 74, 75, 78, 93, 162, 164, 281, 352, 355
 Dicyandiamide, 132
 Di-2-ethylhexyl phthalate, 100
 3,4-Dihydroxybenzoic acid, 106
 Dimensionally stable anodes (DSA), 381
 Dimethylarsinate (DMA), 353
 Dimethyl phthalate (DMP), 124, 134, 136
 1,4-Dioxane, 60, 70–73, 354
 Dioxins, 356
 Diphenyl, 291
 Diquat dibromide, 265
 Direct Yellow 4, 165, 332, 334, 335
 Disordered mesoporous carbon (DMC), 132
 Disperse Blue 71, 327, 357
 Dissolved organic carbon (DOC), 33, 66, 75, 282, 356
 Diuron, 157, 324
 Drinking water, 60, 75, 164, 265, 314, 346, 371, 381
 Dyes, degradation, 15, 30, 47, 100, 120, 157, 176, 210, 214, 242, 265, 288, 313, 326, 343, 403

E

E122, 249, 327, 328
 E124, 249, 327, 328
 E129, 249, 327, 328

- Ecotoxicity, 399, 412, 415
Effluent organic matter (EfOM), 75
Electrochemical activity, 145
Electrochemical advanced oxidation processes (EAOPs), 29, 32, 57, 59, 241, 264, 314, 383, 401
Electrochemical reactors, 205
Electrodes, low-cost, 287
 materials, 399
 packed bed, 263
 parallel plate, 263
 rotating cylinder, 263, 271, 275
 three-dimensional, moving, 205, 217
Electro-Fenton, 1, 15, 29, 34, 59, 85, 111, 145, 175, 241, 296, 343
 catalyst source, 1
 heterogeneous, 85
Electrolyte flow, non-ideal, 263
Electrolytic cells, 1, 313
Electron transfer, 3, 5, 105, 152, 179, 245, 251, 270
Electro-peroxone, 57
Emerging contaminants, 31
Energy requirements, 419
Enoxacin (ENXN), 161
Enrofloxacin, 209, 320, 330
E-peroxone process, 57, 61
Estrogens, 163, 354
Ethanol, 101, 149, 159, 179, 180, 289–292, 304, 358
Ethylene, 360
Evans Blue, 326
- F**
Fast green, 157
Fe(III)-carboxylate complexes, 313
Fenton's reagent, 2, 3, 22, 34, 49, 94, 207, 289, 314, 344, 379, 401
FeOOH, 50, 99, 128, 161, 177, 358
Fered-Fenton, 3, 243, 338, 346, 359, 373
Ferrate(VI), 32, 383
Ferric chloride, 87
Ferric hydroxide, 370, 383
Ferric ions, 86–92, 99, 104, 129, 265
Ferric-salicylic acid, 104
Ferrous iron (Fe²⁺), 58, 90, 212, 303, 307, 346, 359, 372, 403, 414
Ferrous sulfate, 87, 360, 362
Ferryl ions, 2–5, 290
Filter-press flow cell, 263
Flow cell, parallel-plate, 205
Flow-through, 241
- Fluid dynamics, computational, 263
5-Fluorouracil, 44
Formic acid, 33, 97, 220
Fuchsin Acid, 357
Furosemide, 43, 45
- G**
Gas diffusion electrode (GDE), 6, 113, 207, 313, 380
Gemfibrozil, 74, 75, 78
Geosmin, 74, 75, 79
Goethite, 105
Graphene, 111, 120
Graphene oxide, 111, 113, 122
 reduced, 111
Graphite felt, 175, 241, 247
- H**
Haber-Weiss mechanism, 289, 297
Heavy metals, 101, 288, 351, 358
Herbicides, 157, 213, 265, 320, 324
Hierarchically porous carbon (HPC), 130
Hydrocarbons, 159, 399, 420
Hydrogen peroxide, 1, 6, 57, 111, 145, 287
Hydrophilicity, 115, 122, 150, 177, 181, 418
Hydrophobicity, 165, 247, 268
Hydrophobic organic contaminants (HOCs), 403
Hydroquinone, 229, 331
Hydroxyalkyl radicals, 299
Hydroxylation, 3, 97, 282, 290, 323, 387
Hydroxyl radicals, 29, 85, 104, 111, 379
Hydroxypropyl-beta-cyclodextrin (HPCD), 404
Hypochlorous acid, 21
- I**
Ibuprofen, 31, 60, 72, 75, 78, 208, 330, 355
Imidacloprid, 100, 102, 161, 209, 326, 330
Indole, 99
Iron, 2, 18
 zero-valent (ZVI), 90
Iron alginate gel beads (FeAB), 161
Iron hydroxides, 177, 251
Iron oxides, 85, 89, 104, 177, 315, 358
Iron sludge, 6, 19, 60, 128, 177, 199, 344
- K**
Ketones, 330
Ketoprofen, 31

L

Landfill leachate, 30, 47, 163, 243, 338, 346, 359
Lead dioxide, 404
Levafix blue, 357
Levofloxacin, 40, 96, 160, 208
Lipid peroxidation, 2
Lissamine Green B, 100, 161, 403
Luminescence inhibition, 33, 97, 393, 415

M

Magnetite, 89, 104, 107, 128
Malachite green, 157
Maleic acid, 45, 213, 229, 329–331
Manganese, 92, 100, 152, 356
Mass transfer/transport, 7, 64, 70, 111, 162, 180, 206, 220, 244, 263, 349, 372
MCPA, 319, 325
Mecoprop (2-(4-chloro-2-methylphenoxy) propionic acid), 324
Metal-organic frameworks (MOFs), 130
Methanol, 2, 152
Methylene blue (MB), 126, 199, 248, 353
Methyl green, 157
5-Methyl-2-hydroxy-p-benzoquinone, 323
2-Methylisoborneol (MIB), 75
Methyl orange (MO), 117, 135, 162, 191, 198, 268, 357
Methylparaben, 22
Methyl parathion, 157, 297
2-Methyl-p-benzoquinone, 323
 α -Methylphenylglycine, 323
Metoprolol, 38, 46
Metronidazole, 331
Microbial fuel cell (MFC), 49, 155, 163, 358
Micropollutants, 30, 57, 164, 352
Microreactors, 205–229
Mineralization, 30, 379, 417
Mineralization current efficiency (MCE), 35, 95, 210, 271, 317, 352, 389
Monomethylarsinate (MMA), 353

N

Nafion 324, 8, 9
Nafion 417, 10, 216–218
Nafion 424, 9
Naproxen, 31
Nitrate, 5, 21, 159, 194, 328, 338
Nonsteroidal anti-inflammatory drugs (NSAIDs), 31, 355

O

Ordered mesoporous carbons (OMC), 130
Oxalic acid, 33, 45, 72, 97, 159, 213, 216, 229, 316, 323, 391
Oxamic acid, 45, 323–331, 334, 391, 392
Oxoiron, 2, 5
Oxygen evolution reaction (OER), 268
Oxygen reduction reactions (ORRs), 120, 160, 179, 282, 305
Ozonation, 32, 51, 57, 241, 257, 383
Ozone, 21, 57–80, 257, 316, 381, 406

P

Packed bed electrode, 263
Palladium, 129
Paracetamol, 160, 163, 268, 320
Parallel plate electrodes, 213, 263
Parathion, 157, 297
Patents, 343, 361
Pentachlorophenol (PCP), 157, 403
Perfluorooctanoate (PFOA), 137
Permanganate, 356
Peroxicoagulation, 241, 256, 303
Peroxidation, lipids, 2
Peroxydisulfate, 21
Peroxone, 58
Peroxonium ion, 412
Persistent organic pollutants (POPs), 147, 156
Persulfates, 153, 406
Pesticides, 15, 30, 102, 313, 319, 324
Petroleum hydrocarbons, 360, 403
pH, 412
Pharmaceuticals and personal care products (PPCPs), 344, 381
Pharmaceuticals, degradation, 15, 30, 47, 70, 159, 176, 242, 313, 343, 380
mineralization, 417
Phenanthrene, 36, 403
Phenol(s), 2, 70, 73, 91, 101, 122, 176, 242, 268, 297
Photoelectro-Fenton (PEF), 47
Photoelectro-peroxone (PE-peroxone) process, 67
Photolysis, 5, 58, 69, 313, 317, 331
Photoreactors, 214, 281, 313–339, 352
Phthalic acid, 323, 324
Platinum, 156, 207, 216, 268, 357, 404
 p -Nitrophenol (PNP), 75, 80, 100, 118, 159, 163, 181, 300, 358
Polyaniline (PANi), 153
Polycyclic aromatic hydrocarbons (PAHs), 159, 403

- Polyphenols, 338, 356
Polypyrrole (PPy), 153
Polytetrafluoroethylene (PTFE), 101, 113, 246
Prussian blue (ferric hexacyanoferrate), 155
Pulp and paper industry, 6, 349, 355
Pyrite, 19, 85, 92–98, 107, 160, 161, 346
Pyrrhotite, 162
- Q**
Quinone-functionalized graphene,
 electrochemical exfoliation approach
 (QEEG), 130
- R**
Ranitidine, 35, 43, 45, 208, 331
Reactive Black 5, 100, 103, 357
Reactive oxygen species (ROS), 4, 20, 316
Reactive Yellow, 265
Reactors, electrochemical, 263
 flow-through, 241
 pressurized, 205, 220
Reduced graphene oxide (rGO), 113, 120, 151
Refractory organic pollutants, 343
Resorcinol, 331
Reticulated vitreous carbon (RVC), 7, 59, 113,
 147, 207, 268, 275, 357, 380
Rhodamine B, 90, 103, 163, 330, 338
Rotating cylinder electrode, 263, 271, 275
- S**
Saccharin (SAC), 381
Salicylic acid, 92, 104, 249, 330, 336
Sepiolite, iron-loaded, 103
Slaughterhouse effluent, 42, 338, 360
Sludge, iron, 6, 19, 60, 128, 177, 199, 344
Sodium sulfate, 222, 302
Soil flushing (SF), 400
Soil respirometry, 415
Soil washing, 36, 93, 159, 400
Solar photoelectro-Fenton (SPEF), 47, 165, 313
Solar photoreactor, 214, 281, 318, 334, 338, 352
Solar pilot plants, 313
Sucralose (SUC), 381
Sulfamethazine, 41, 49, 96, 97
Sulfanilamide, 165, 320, 331, 352
Sulfanilic acid, 319, 323
Sunlight, 3, 165, 313, 339, 346, 356
Sunset Yellow FCF, 326
Surface area, 3, 19, 89, 101, 111, 145, 177, 191,
 217, 241, 315, 352, 368, 406
Surface characteristics, 175, 191
Surface water, 11, 30, 65, 74, 79, 346
- Surfactants, 130, 355, 399, 412
 nonionic, 410
Synthetic organic compounds (SOCs), 353
- T**
Tank cells, 205, 207, 326
Tartaric acid, 2, 289, 323, 327, 344
Tartrazine, 162, 254, 357
Tebuthiuron, 324
Tetracycline, 37, 208, 209, 212, 249,
 255–257
Textile industry, 288, 356
Tissue paper wastewater, 360
Total organic carbon (TOC), 22, 33,
 57, 60, 120, 157, 181, 193, 210,
 317, 414
 mineralization, 57
Toxicity, 29
 ecotoxicity, 399, 412, 415
 tests, 38
Transition metals, 19, 58, 67, 89, 155,
 194, 198
 doping, 175, 177
Triclocarban, 159
Triclosan, 159, 208
Trimethoprim, 332, 355
Trinitrotoluene (TNT), 403
Triton X-100, 410
Tween 80, 36, 410–420
Tyloxapol, 410
Tyrosol, 96–98, 160
- U**
Ultraviolet, 58, 288
UVA, 3, 316, 346, 358
UVB/UVC, 316
UV/H₂O₂ processes, 58
- W**
Wastewater, acidic, 315
 chemical industry, 355
 domestic, 163
 industrial, 255, 258, 264, 355
 leather tanning industry, 360
 medicinal herbs, 163
 soil pollutants, 401
 textile, 288, 350, 372
 winery, 209, 338, 358
Wastewater treatment, 57, 85, 147, 156, 263,
 291, 296, 343, 379
 agro-industrial, 358
 prediction, 287

Wastewater treatment plants (WWTPs),
30, 75, 353
Water treatment, 29, 57, 85, 343

X

Xylenol, 268

Z

Zahn-Wellens assays, 33
Zeolite-modified electrodes (ZMEs), 155
Zeolites, 6, 85, 102, 155–158
 iron-supported, 85, 102
Zeolitic imidazolate framework
 (ZIF-8), 156