

Index

a

affinity sensors 71
 AgNPs@PDA catalyst 11
 amorphous semiconductor model (ASM), of melanin conductivity 7–8
 amperometric biosensors 72
 anisotropic electrically conductive polymer composites 169
 anthracene doped PANI nanofibers, for biosensing response studies 120
 antibacterial effect, of PANI-polyvinylalcohol composite film 202
 antimicrobial activity, of silver coated PANI nanoparticle 204
 antimicrobial applications, of PDA 12, 15
 aptamer–prion complex 62
 aptamer sensors 61–62
 Au@carbon dots–chitosan composite film 150
 Au nanoparticle–PPy–rGO nanocomposite based acetyl cholinesterase biosensor 104–105
 AuNP–AgCl@PANI hybrid material 119
 autonomic-healing 163
 autonomic-repairing 163

b

bacterial cellulose nanofibers 206
 BCR/ABL fusion gene identification 100

bioimaging, of PDA 15, 17
 bio-inspired materials (BiM) 1
 biomimetic materials 164
 biosensors 96, 113
 amperometric biosensors 72
 calorimetric biosensors 71
 characteristics 138
 cholesterol biosensors 77–78
 conducting polymers in 96
 definition 70
 design, PANI's importance 118
 elements 70
 enzyme-immobilized 114
 features 71
 glucose biosensors 76–77
 hydrogen peroxide (H_2O_2) sensors 75–76
 mode of action 71
 nucleic acid biosensors 78–79
 optical biosensors 72
 phenolic compounds 123
 potentiometric biosensors 72
 scope of 72–73
 bone tissue engineering 208
 bovine serum albumin (BSA) determination 149
 Brodie's method 94

c

calorimetric biosensors 71
 cancer therapy, PDA in 16–21
 capsule-based self-healing materials 165
 capture probes 80
 carbamates determination 151

- carbon-based nanomaterials
 carbon nanotubes (CNTs) 73–74
 graphene (GN) 73
 carbon nanotubes (CNTs) 73
 interaction with PANI 74–75
 cell adhesion and proliferation, of
 PDA 16, 19
 cell adhesion potential, of L929
 fibroblasts 205
 cell patterning, with PDA 19
 C6 glioma cells 209
 chemical sensors 70
 chemical synthesis, of conducting
 polymers 221
 chitosan
 chemical and biological properties 138
 structure 138
 chitosan-based biosensors 138
 biological and environmental
 field 151
 clinical diagnosis and
 biomedicine 152
 farm, garden and veterinary
 analysis 152
 fermentation control 152
 industrial effluent control 152
 microbiology 152
 military applications 152
 pharmaceutical and drug
 analysis 152
 pollution control 152
 types of 140, 151
 chitosan-gelatin/nanohydroxyapatite
 polyaniline composite
 scaffolds 208
 chitosan-glucose oxidase immobilized
 polypyrrole/Nafion/
 functionalized multi-walled
 carbon nanotubes bio-
 nanohybrid film 139
 chitosan-gold nanoparticles composite
 film 148
 chitosan grafted polyaniline (CPANI)
 cryogel matrix, for sialic acid
 detection 150
 chitosan/ionic liquid-graphene
 composite preparation 149
- chitosan-iron oxide nanocomposite
 films 139
 chitosan modified multiwall carbon
 nanotubes biosensor 148
 chitosan/polypyrrole-nanotubes/gold
 nanoparticles
 nanocomposites 149
 cholesterol biosensors 77–78
 comproportionation reaction
 (CRR) 9–10
 concoction oxidation 37
 conducting BC-PANI
 nanocomposite 210
 conducting nanocomposites 39
 conducting polymer composites,
 interaction with CNT and GN
 for detection of organic
 molecules 80–83
 for microbial sensing 83
 conducting polymers (CPs) 73–74, 96
 biosensors 227
 chemical synthesis 221
 composites/blends
 based on conjugated
 CPs 223–224
in-situ polymerization
 method 225
 latex technology 225
 melt processing 225
 solvent mixing method 225
 drug targeting and
 delivery 226–227
 electrochemical synthesis 221
 future prospects of 228, 222
 poly(3,4-ethylenedioxythiophene) 222
 polypyrrole 221–222
 properties 219
 structures 220
 tissue engineering and regenerative
 medicine 227
 conductive electroactive polymers
 (CEPs) 200
 conductive healable materials
 advantages 170
 applications 170
 co-precipitation technique 40
 cryomilling strategy 39

- Cu-chitosan/multiwalled carbon nanotube film 148
- cyclic voltammetry (CV) 190, 226
- d**
- daunomycin 61, 98
- dilute magnetic semiconductors (DMS) 36
- DNA biosensors 55–56, 98, 100
for avian influenza virus H5N1 gene sequence detection 54
cauliflower mosaic virus 35S promoter gene detection 57
- PANI–AuNP nanocomposite 57
- polyaniline nanofibers-AuNP nanocomposite 58
- DNA electrochemical biosensor 100
- dopamine detection 150–151
- drug delivery, PDA capsules 11–12
- drug loading behavior, of PDA capsules 11
- e**
- electrical conductivity
- PANI/hydrophilic montmorillonite composites 52
- PANI/organophilic montmorillonite composites 52
- PANI/TiO₂ nanocomposites 52
- PPy/SiO₂ nanocomposite 52
- PPy/SrFe₁₂O₁₉ nanocomposites 52
- electrically conductive polymer (ECP) biosensors 227
- composites 169
- for drug targeting and delivery 226–227
- medical applications 219
- for tissue engineering and regenerative medicine 227
- electrochemical DNA sensor construction process 57–58, 101
- electrochemically-reduced grapheme oxide-chitosan/hemoglobin nanocomposite 139
- electrochemical sensors 114
- electrochemical synthesis, of conducting polymers 221
- electropolymerization process 2
- elongation at break
- PU/clay nanocomposites 50
- enzymatic polymerization, of PDA 2
- enzyme-based glucose sensing device 95
- enzyme immobilization 77
- enzyme-immobilized biosensors 114
- ethyl cellulose (EC) 182
- biological efficacy of PANI-based composites and 192–193
- EC-based composites activation energies 187 conductivity of 184–187 electrode potentials 188
- EC-inorganic composites, synthesis of 183
- eumelanin 6
- extended graphite 93
- extrinsic self-healing 165
- f**
- FECTs-based glucose sensor 106
- ferrites 35
- ferrocene mediated electrochemical biosensor 137
- FET H₂O₂ biosensor 103
- fibre-based self-healing approach 165
- fibronectin, cell adsorption property of 207
- film casting method 39
- film deposition approach, for PMNC preparation 39
- first generation biosensors 72
- g**
- glucose biosensors 76–77
- boron nitride nanotubes-PANI-PtNPs hybrid 120
- cytochrome c/AuNPs/PANI nanospheres 120
- from PtNPs/PANI hydrogel 119
- GOX immobilized on PANI-NT 119
- PANI-SWCNTs hybrid system 118
- glucose sensors 107
- GOX/TiO₂-NPs/PANI/glassy carbon electrode 120

- graphene (GN) 73, 93
 graphene-based PANI
 nanocomposites 97
 graphene-based polymer
 composites 96
 graphene oxide (GO) 93
 preparation methods 94
 graphene/PVP/PANI nanocomposites
 modified paper based
 biosensor 97–98
 graphite intercalated compounds 93
- h***
 HDPE nanocomposites, thermal
 conductivity of 51
 healing compatibility 167
 H_2O_2 biosensors 103
 HP/PPy/GO nanosheets 104
 Hummer's method 94
 hybrid gel based conductive
 material 169
 hydrogen peroxide (H_2O_2)
 sensors 75–76
- i***
 immunosensors 122
 aflatoxin B1 study 59
 alpha-fetoprotein detection 60
 carbohydrate antigen 72-4
 detection 61
 microcystin-LR analysis 60
 prostate-specific antigen
 detection 59
 sensitivity 59
 in situ oxidative polymerization
 method 206
 in-situ polymerization method 225
 in situ polymerization strategy, for
 PMNC preparation 41
 insulin detection, SPR immunosensor
 for 227
 intrinsic self-healing 165, 167–168
 ionic liquid–carbon paste electrode
 (IL–CPE) 56
 iron oxide nanoparticles/chitosan graft–
 polyaniline nanocomposite
 film 149
- iron oxide nanoparticles
 (IONPs@PPy-PEG) 43
- k***
 kanamycin analysis 57
- l***
 laccase-catalyzed polymerization 2
 laminin protein, cell adsorption
 property of 207
 latex technology 225
 L929 fibroblasts, cell adhesion potential
 of 205
 light transmittance, in polycarbonate/
 alumina composite 53
 L929 murine fibroblasts 206
- m***
 magnetic hysteresis loops, PEDOT/
 PSS- Fe_3O_4 nanocomposites 55
 magnetic nanoparticles-based
 multifunctional polymer
 nanocomposites 33
 magnetic semiconductor based polymer
 nanocomposites,
 biocompatibility 42–43
 magnetic semiconductor
 nanoparticles 34
 based polymer nanocomposites 34
 dilute magnetic semiconductors 36
 ferrites 35
 manganites 37
 metal and metal oxide
 nanoparticles 34–35
 magnetoelectric polymeric
 nanocomposites 32
 malathion detection 139
 manganites 37
 mediator-free H_2O_2 biosensor 120
 melanin broadband optical absorbance
 spectrum 8
 melanin conductivity
 amorphous semiconductor
 model 7–8
 spin muon resonance model 8–10
 melanin dark conductivity vs. water
 content 8

- melt processing technique 225
mesoporous SiO₂ 12
microbial biosensor 123
MRI-guided chemo-thermal treatment 20
Mycobacterium tuberculosis nucleic acid biosensor 122
- n**
Nafion–AgCl@PANI-GC electrode 118
nano-Prussian blue–chitosan film 150
nerve tissue engineering 208
neural prosthetics 208
NiCo/PPy/RGO nanocomposites 105–106
NIH-3T3 fibroblasts 204, 206
nucleic acid biosensors 78–79, 121
- o**
optical biosensors 72
organic polymer-based inorganic nanoparticle composites 47
organic semiconductors 6
- p**
PANI-Ag-Pt nanocomposite 210
PANI-based composites
 biological efficacy of ethyl cellulose and 192–193
 conductivity of 190–191
 galvanostatic discharge curves 191
 synthesis of 189
PANI-based 2-hydroxyethylcellulose–polyaniline (HEC-PANI) nanocomposite cryogens 210
PANI composites, interaction with
 CNTs and GN 74–75
 cholesterol biosensors 77–78
 glucose biosensors 76–77
 hydrogen peroxide (H₂O₂) sensors 75–76
 nucleic acid biosensors 78
PANI nanotubes/Au hybrid nanostructures 121
PANI/PCL-mesoporous silicon supported composite 208
- PANI polymer
 conductivity of 187, 191
 conductivity of PANI-based composites 190–191
 galvanostatic discharge curves 191
 protonation and deprotonation of 188
 synthesis of PANI-based composites 189
PANI supported nano-hybrid materials 201
 antimicrobial activity 202–204
 biocompatibility 201–202
 tissue engineering 204–211
PC-12 cells cultivation 208
PDA fluorescence organic nanoparticles (PDA-FONs) 16–17
PDA-laccase–MWCNTs
 nanocomposite film 2, 3
PDA-modified SiO₂ scaffolds 12
PDAs@CP₃-DOX 22
phenazopyridine hydrochloride determination 148
phenolic compounds biosensors 123
photoconductivity experiments, of melanin 8
photothermal therapy (PTT) 16, 20
polyaniline (PANI) 199
 biosensor applications 97
 chemical structure 97
 drawbacks 200
 high electrical conductivity 199
 oxidized and reduced forms 200
 platelet adsorption 203
polyaniline based biosensors
 genetic materials 121–122
 glucose biosensors 118–120
 peroxide biosensors 120–121
 scientific concerns and future prospects 124–126
 for water quality
 assessment 123–124
polydopamine (PDA) 1
 adhesive property 5, 6
 biocompatibility and biodegradation property 6
 biomedical applications 11–21

- polydopamine (PDA) (*contd.*)
 coating and strong adhesive
 applications 1
 electrical conductivity 6
 electrical properties 6–10
 energy-related application 11
 nanotube synthesis 3
 optical properties 5
 polymerization 2–3
 synthesis 2–5
 zwitterionic property 12
 polyethylene/clay nanocomposite
 preparation 48
 poly(3,4-ethylenedioxythiophene)\
 poly(4-styrenesulphonate)
 (PEDOT\PSS) 6
 poly(ethylene glycol) methyl ether-
 tetraamine composite 209
 polyglycerol dendrimers-PANI diluted
 extracts 209
 poly(3-hexylthiophene) (P3HT) 6
 poly(2-hydroxyethyl methacrylate)-
 single-walled carbon nanotube
 composites 169
 poly-L-Lysine dendrimers 207
 polymer-based nanocomposites
 biocompatibility of 42
 biomedical applications 43
 polymer-graphene
 nanocomposites 96
 polymer-inorganic nanocomposite
 (PINCs) 31
 aptamer sensors 61–62
 DNA biosensors 54–58
 electrical properties 52
 immunosensors 58–61
 magnetic properties 54
 mechanical properties 48–51
 optical properties 53–54
 simple melt compounding
 method 48
 synthesis routes, schematic
 representation 49
 thermal properties 51
 polymer/magnetic semiconductor
 nanocomposites (PMNCs) 38
 amalgamation 38
- chemical preparation
 techniques 40–42
 physical preparation
 techniques 38–39
 polymer nanocomposite-based DNA
 sensors 54–56
 polyphenol oxidases-gold
 nanoparticles-graphene-
 chitosan hybrid film 151
 polypyrrole (PPy)
 biosensor applications 102
 chemical structure 97
 polypyrrole-chitosan-iron oxide
 nanocomposite films 148
 polypyrrole cross-linked chitosan/
 glucose oxidase/gold
 bionanocomposite film 149
 polypyrrole derivative 39
 polyurethane (PU)-based clay
 nanocomposites 50
 potentiometric biosensors 72
 PPy and PTh composites, interaction
 with CNTs and GN 79–80
- r**
- rabbit IgG antigen detection,
 immunosensor for 227
 reduced graphene oxide (rGO) 95
 rGO/PPy/AuNP biosensor 104
 rutin determination 148
- s**
- saturation magnetization
 of PANI/Fe₃O₄@Au
 nanocomposite 54
 of PANI/Fe₃O₄ nanocomposite 54
 of PPy/SrFe₁₂O₁₉
 nanocomposite 54
 self-healing, definition of 163
 self healing materials
 classification of 164–168
 conductivity in 169
 future prospects 171
 history of 163–164
 polymers 164
 structural 171
 use 164

- self-healing polymer systems, under
quasi-static fracture 168
- self-healing thermally conductive
polymer composites 171
- self-repairing 163
- serotonin (5-HT) biosensor preparation
scheme 103
- sialic acid detection 150
- silicon rubber (SR) filled with graphite
nanoplatelet synthesis 170
- skeletal muscle cells, biocompatible
behavior of 207
- solution casting method 39
- solvent mixing method 225
- spin muon resonance model (SMRM),
of melanin conductivity 8–10
- ssDNA/PANI/graphene/GCE electrode
preparation technique 100
- Staudenmaier's method 94
- stress-strain curves, for PU/clay
films 50
- structural self-healing materials 171
- sub-micron size PDA particles 4
- sulfonated polyaniline (SPAN) 98
- super-paramagnetic iron oxide
nanoparticles (SPIONs) 32,
35
- surface plasmon resonance (SPR)
biosensor 148
- synthetic melanin 6
- t**
- tensile strength, PU/clay
nanocomposites 50
- theranostics 20
- thermal conductivity, of HDPE
nanocomposites 51
- thermally reduced graphene oxide
(TRGO) 95
- thrombin determination 61
- TiO₂@polydopamine photocatalyst 11
- tissue engineering 204–205
- camphorsulfonic acid-PANI/poly(L-lactide-co-e-caprolactone)
nanofibers 204
- chitosan-gelatin/nanohydroxyapatite
polyaniline composite
scaffolds 208
- PANI-Ag-Pt nanocomposite 210
- PANI-based 2-hydroxyethylcellulose-polyaniline (HEC-PANI)
nanocomposite cryogens 210
- PANI/PCL-mesoporous silicon
supported composite 208
- PANI-poly(3-hydroxybutyric acid)
matrix 206
- poly(ethylene glycol) methyl ether-tetraamine composite 209
- polyglycerol dendrimers-PANI
diluted extracts 209
- tissue engineering application, of
PDA 12
- total dissolved salts (TDS) 72
- transparencies, of PINC 53
- transparent polymethyl methacrylate
(PMMA)-ZnO nanocomposite
preparation 41
- v**
- vascular self-healing
materials 165–167
- voltammetric strategy 100
- w**
- water-melanin adsorption
isotherm 7–8
- water quality assessment, PANI based
biosensor for 123–124
- whole bacterial cell-based
biosensor 124
- woven glucose sensing sensors 105
- z**
- zwitterionic property 12

