

Index

a

absorb guest molecule 292
 absorption of amine noxious gas 300
 active sites 146–149, 159, 162, 165, 166, 172
 aerochromic properties 300
 alkylation of phenol 130
 alloying-dealloying 10, 13
 α -Fe 1, 14, 15, 175
 aluminothermic reaction 95
 ambient pressure 53, 54, 65–67, 215
 amorphous phases 5, 8, 11, 16, 66, 97
 anion driven light-induced spin change (AD-LISC) 274
 anisotropy of recoil-free fractions 216, 232
 antiferromagnetic 13, 55, 59, 62, 68, 73, 79, 81, 130, 256, 262
 asymmetry parameter 52, 56, 58, 60, 65, 66, 71, 75, 76, 221
 atomically dispersed iron hydroxide 165
 Au-based catalysts 145, 155–158
 ^{197}Au Mössbauer spectroscopy 151–152, 166, 195–208
 Au nano-clusters 195–197, 208
 Au-S distance 198, 201
 AuSn alloy 150, 151
 Au/SnO_x-Al₂O₃ catalysts 150
 Au valence transition 215, 216, 239–241, 244

b

β -Sn 2–10, 16
 bimetallic AuSn particles 151
 bimetallic iron oxide phases 130
 bimodal isomer shift distribution 45
 biogenic iron oxides 149, 165
 biomedicines 102
 broadened doublet 66

c

catalysts 2, 21–26, 101, 102, 107, 113–137, 145–151, 153–166, 171, 172–175
 carbon-supported bimetallic 127
 catalytic activity 24, 127, 132–134, 136, 148, 149, 179, 180
 cationic Au species 158, 166
 charge-discharge cycles 2, 5, 8, 18–20
 charge transfer interaction 214, 216, 225–231, 242–244
 chemical looping process 130
 chemical vapor deposition (CVD) 102, 104, 186
 color change mechanism 292, 300, 303
 colorimetric sensor 291–306
 competitive adsorption 146, 159
 computational Mössbauer spectroscopy 175, 187
 controlled surface reaction (CSR) method 150
 conversion reaction 8, 10, 15, 26

- coordination environment 45, 53, 54, 62, 63
 CO oxidation 145–166
⁵⁷Co(Rh) radioactive source 293
 correlation coefficients 47, 48, 53, 69, 71–73
 Coulomb interaction 68
 cross-coupling reactions 136
 crystalline 3–5, 15, 16, 54, 60, 66, 68, 96, 124, 131, 132, 187, 279
 crystallographic structures 62–64
 crystal transformation 104
 Cs₂[Au^IX₂][Au^{III}Y₄] (X, Y = Cl, Br, I) 229–231, 242, 243
 CsFeCr(CN)₆·1.3H₂O 252–254
 Cu-based catalysts 145
 CuO/CeO₂ with Fe₂O₃ additive 165
 Curie temperature (TC) 101, 254
 cyano-bridged metal complexes 251, 265
 cyclic oligomers 196, 200
 formation of 200
- d**
- d–d absorption 292, 295
 d–d transition of LS Fe(II) ions 283
 Debye temperature 82, 119, 174, 232, 233, 274
 degradation mechanism 173, 175, 180–184
 demetallation 175, 181, 182, 184
 densities 1, 3, 4, 17, 63, 64, 67, 68, 73, 74, 79, 81, 83, 104, 107, 113, 117, 126, 154, 172, 174–176, 182
 density functional theory (DFT) 3, 4, 68, 73, 162, 182, 196
 calculation for Au₁₀(SCH₃)₁₀ 198
 detection performance 292, 300
 diffraction patterns 61, 66, 218, 219, 274
 diffuse reflectance optical absorption (DRUVS) 148
 dipolar anisotropy 59
 dipolar interactions 59
 DO₃ cubic structure 97, 100
 dopant location 105
- e**
- electric field gradient 51, 52, 58, 65, 73, 75, 78, 174
 electrocatalysts 114, 124, 134, 171
 electrochemical energy storage,
 electrochemical mechanism 4, 7, 8, 10, 16
 electrochemical reaction 1–7, 13, 26
 electrochemical tip-enhanced Raman spectroscopy (EC-TERS) 175
 electrode materials 1–3, 17–19, 26
 electron density 8, 83, 104, 107, 117, 173, 179, 185, 221, 223
 electrospray ionization (ESI) mass spectroscopy 197
 extended X-ray absorption fine structure (EXAFS) 148, 175
- f**
- face-fused bi-icosahedral Au₂₃ core 204, 205, 208
 FC and ZFC curves 101
 Fe₃C 120, 177
 [Fe(H₂btm)₂(H₂O)₂]Cl₂ 293, 295
 Fe(II) coordination sphere 306
 η-Fe_{0.9}Mn_{0.1}PO₄ 67, 68–73
 [Fe(Hbta)₂(H₂O)₂]·2H₂O 293, 300
 FeIr alloy 160–163
 Fe macrocycle 171, 174, 175, 177, 179
 Fe(II) mononuclear complexes 278–281
 FeN₄ 120, 133, 134, 177–182, 184
 Fe₂[Nb(CN)₈](4-pyridinealdoxime)₈·2H₂O 252, 254–258, 262
 [Fe(trz-tet)₂(H₂O)₄]·nH₂O 293
 FeN₆ octahedron 284
 FeN_x 175, 177–180, 182, 184–187
 Fe phthalocyanine (FePc) 171
 Fe_{1.19}PO₄(OH)_{0.57}(H₂O)_{0.43} 18–19
 Fe porphyrin 171
 ferric-hydroperoxo hemes 135
 ferristrunzite 35, 39, 50
 ferrocene-polydimethylsilane composites 99–101
 ferromagnetic behavior 101
 ferromagnetism 126, 208, 214, 254, 256

- FeSi₂ 95, 102, 104, 106
 Fe₃Si 93, 96, 97, 100, 101, 104
 Fe₅Si₃ 93, 96, 97, 101
 Fe substituted Ni–Si intermetallics 105–107
 Fe vacancies 19
 Fischer–Tropsch process 126
 fluorapatite mineral 50
- g**
- γ -Al₂O₃ supported iron catalysts 148
 γ -Fe,
 γ -Fe₂O₃ 107, 148, 149
 generalized gradient approximation 68
 geometrical structure 196, 204
 gold mixed valence complexes 213–244
 green-light irradiation 272
 guest adsorption 296
 guest vapor molecules, adsorption of 306
- h**
- Haber–Bosch synthesis 135
 hagendorfite 45–48
 half-wave potential 172
 heat treatment, of Fe macrocycles 171
 heteroatomic doped carbon 171
 heterogeneous catalysis 33, 93, 124
 heteroleptic complex 279
 Hg lamp irradiation 273
 high-pressure orthorhombic phase 65
 high-spin 17, 19, 20, 45, 47, 48, 52, 59, 65, 68, 79, 134, 136, 179, 253
 hydrodesulfurization 107
 hydrothermal synthesis 18, 62
- i**
- icosahedron 196, 201
 impregnation sequence 159, 163, 165
 induced coupled plasma-mass spectroscopy (ICP-MS) 174
 in-field applications 295
 in situ and operando techniques 173
 in situ characterization 175
 in situ water gas shift reaction 130
- interlocked pentamers 198, 200
 inter-valence charge transfer (IVCT) 213–215
 IrFe-containing catalysts 158–165
¹⁹³Ir Mössbauer spectroscopy 152
 iron and nitrogen co-doped carbon (Fe-N-C) 171
 iron(III) magnetic moments 57–59
 iron-57 Mössbauer spectral 33, 37, 48, 51, 52
 iron oxide supported Au catalysts 147
 iron-oxidizing bacteria 165
 iron silicides 93, 95–108
 Ir–Pt containing samples 152
 isostructural 53, 64
- j**
- Johnson–Mehl–Avrami–Kolmogorov (JMAK) model 276
- k**
- KFe₃(SO₄)₂(OH) 49
- l**
- Lamb–Mössbauer factors 174
 lattice parameters 19, 64, 104, 105, 218, 219
 layered double hydroxides (LDH) 130
 layered double oxyhydroxide 124
 ligand-driven light-induced spin change (LD-LISC) 272
 light-induced electron transfer 274
 light-induced excited spin-state trapping (LIESST) effect 251, 254, 257, 272
 light irradiation 256, 261
 Li-ion batteries 2–17
 Li–Sn alloying reactions 3, 16
 lithium iron phosphate (LiFePO₄) 1, 2, 17–18
 Lorentzian static magnetic sextets 55
 low-coordinate high-spin 136
 low electrical resistivity 93
 lower isomer shift 45, 296

m

- magic angle θ 52, 72
 magnetically recording materials 101, 102
 magnetically separable catalysts 101, 102
 magnetic anisotropy 59
 magnetic field (MF) 2, 14, 130, 147, 173, 174, 255
 magnetic hyperfine field 51, 59, 76, 147, 173
 magnetic hysteresis loop 255, 261
 magnetic neutron scattering 55, 59
 magnetic properties 67, 81, 101, 107, 258
 magnetic splitting 51, 117
 magnetic states 251, 262, 263
 magnetic transition 60, 65
 mars-relevant phosphate minerals 37
 mechanical alloying 95–98, 107
 metal-organic framework (MOF) 125, 132, 133, 254, 258, 263, 292
 metal silicides 93, 99
 metal-to-metal charge transfer (MMCT) 254, 258
 metastable γ -FePO₄ and ζ -FePO₄ 63
 mixed-valence compound, α -Fe₂(PO₄)O 74
 molar magnetic susceptibility 252
 molecular orbital calculation 221, 227, 243, 244
 molecular structure 196, 198–201, 204, 207
 monoclinic 53, 54, 62–64, 235
 monomeric staples (-SR-Au-SR-) 204
 Mössbauer-effect 33, 50, 51, 60

n

- Na-ion batteries 1–21
 NaI(Tl) scintillation counter 198, 217
 nano-clusters 195–197
 nanocomposite 10, 13, 15, 16, 26, 95, 96, 133
 Nasicon structure (sodium super ionic conductor) 19

- Néel temperature 55, 58–60, 65, 68, 74, 79, 81, 84
 negative electrode 1–17
 neutron activation analysis (NAA) 174
 neutron diffraction 57–61, 74
 neutron scattering 55, 59–61
 NH₄H₂PO₄ 68
 [NH₃(CH₂)_nNH₃]₂[(Au^II₂)(Au^{III}I₄)(I₃)₂]
 (n = 7, 8) 217
 non-aqua coordinated complex 304
 nonequivalent lattice sites 97
 nonprecious metal catalyst 171
 non-zero asymmetry parameter 58
 nuclear decay scheme 217
 nuclear magnetic moment 53

o

- OH groups 147, 148, 151, 163, 165, 166
 oligomers 196, 200, 203, 204
 1D Fe(II) Coordination Polymer 281–284
 operando measurement 113
 orthorhombic *Pnma* 63, 67, 68, 73
 orthorhombic polymorphs 53, 62, 64, 66
 oxidation state 2, 5, 8, 14, 22, 26, 37, 82, 130, 136
 oxidic environment 45, 47
 oxygen reduction reaction (ORR) 120, 171–187
 oxygen storage capacities (OSC) 156
 oxygen vacancies 151

p

- paramagnetic spectrum 52, 66
 paramagnetic symmetric 55
para-sulfocinnamic acid (psca) 275
 particles 1, 3–5, 8, 10, 11, 13–16, 22–24, 100, 101, 104, 107, 114, 120, 124–126, 128, 129, 148, 151, 155
 Pd atom coordination number, with neighboring Au atoms 205
 perturbation criterion 51
 phase transition 33, 53, 60, 215, 216, 236, 239, 244, 252–254, 258
 photo-Fenton catalyst 133

- photo-induced transformation 274
 photo-responsive anion 274–276
 photo-responsive ligands 272
 photoswitching 258, 261, 263, 276
 photovoltaic 93
 platinum group metal (PGM) 145, 171
 polyhedral unit 34
 polymeric electrolyte membrane fuel cells (PEMFC) 145
 polymorphs 53–54, 62–73
 polynuclear Fe-N centers 135
 porous carbon supported IrFe catalysts 158–159
 porous coordination polymer (PCP) 292
 positive electrode 1–3, 10, 17–19, 26
 power density 172
 preferential oxidation of CO, in H₂ (PROX) 145
 proton exchange membrane fuel cells 171–187
 Prussian blue 133, 214, 252, 254, 265
 analogue 133
 Prussian blue (Fe^{III}₄[Fe^{II}(CN)₆]₃ · 15H₂O) 214
 pseudomonoclinic 81, 83
 pseudooctahedral coordination 53, 54, 62, 79, 81
 pseudooctahedral environment 64
 pseudooctahedral high-spin iron(III) coordination 68
 pseudooctahedral oxygen coordination environment 45
 PtFe-containing catalysts 153–155
¹⁹⁶Pt metal foil 198, 217
 Pt-Sn alloy 25, 26, 128, 129, 166
 Pt-Sn catalysts 21
 Pt-Sn-In catalysts 27
 pyrolysis 20, 99–101, 107, 120, 121, 172, 173, 180, 184, 185
- q**
 quadrupole coupling constant 52, 55–56, 58, 66, 71
 quasi-in situ Mössbauer studies 159–165
 quick freezing technique 114
- r**
 Raman spectroscopy 60, 175, 216, 239, 243, 244
 real-time detection 292
 recoil-free fractions 15, 119, 196, 198, 201, 205, 216, 232, 233
 reduced hyperfine field 59, 60
 reducible metal oxide promoted PGM catalysts 146
 regeneration performance of, adsorption and de-adsorption 300
 relativistic effect 221
 rotating ring-disk electrode (RRDE) 172
- s**
 secondary electrons 122
 second harmonic generation (SHG) 252
 second harmonic (SH) light ($\lambda = 532$ nm) 259, 261
 sensor and switching materials 251, 265
 SG ligands 198, 201, 208
 SG protected gold clusters 208
 silane 102
 single-atom catalysts (SAC) 166
 single-crystal ¹⁹⁷Au Mössbauer spectroscopy 234
 SiO₂ and Al₂O₃ supported IrFe catalysts 159–165
 preparation and activity 159
 site density (SD) 172, 186
 six dimeric staples (-SR-[Au-SR]₂) 204
¹¹⁹Sn Mössbauer spectroscopy 3, 4, 6, 8, 10, 22, 24, 26, 150–151
 “Sn⁴⁺-Pt” ensemble sites 150
 Sn species 22, 25, 129, 150, 151
 solid solution 20, 21
 space group *Cmcm* 54, 64, 65
 space group *P2₁/n* 53, 62
 spectral hyperfine parameters 37, 45, 48, 52, 65
 spin crossover (SCO) compounds 272, 292
 phenomenon 252, 254, 258, 265
 spinel materials 148

- spin reorientation 59
 spintronic devices 101
 standard enthalpy 34
 standard heat of formation 53
 stoichiometric 54, 68, 79–81, 155
 structure-activity relationship 173, 179, 187
 superexchange interaction 256, 258, 262
 superparamagnetic behavior 101
 superparamagnetic blocking temperature 101
 superparamagnetism 126
 superposition 198, 200, 201, 205
 symmetric octahedron 296
 symmetric quadrupole doublet 55, 295
 synergistic effect 107, 149, 177
- t**
- temperature-programmed reaction (TPRe) 150
 temperature-programmed silicification 102–104
 template-sacrificial approach 133
 ${}^5T_{2g}r^5E_g$ d–d transition of HS Fe(II) ions 283
 thermal interdiffusion 104
 thermal stability 93
 thermodynamic properties 34–37
 FePO₄ polymorphs 53–54
 thermodynamic stability 54
 thermoelectric 93, 95, 104
 thiolate-protected Au nano-clusters 196, 208
 thiolate protected gold clusters 195–208
- thiolate-protected intermetallic clusters 204
 thiulates 200, 203
 3D metal-organic framework 258
 three-electrode system 175
 tin-based intermetallics 13–17
 tin borophosphates 2, 10–13
 tin oxides 2, 7–11, 13, 14, 26
 transition temperature where HS and LS are equally populated ($T_{1/2}$) 275
 trigonal $P3_121$ 58
 turnover frequency 172
 two-phase reaction 3, 14, 17, 20
- u**
- ultraviolet-visible (UV-vis) absorption spectra 254
 UV irradiation 274, 277, 278, 283–285
- v**
- valence skipping 214, 239, 244
 velocity 8, 51, 82, 120, 151, 153, 158, 198
 volatile organic compound (VOC) 293
- w**
- weakly bound oxygen species 148
 Wissel spectrometer 293
- x**
- X-ray absorption near edge structure (XANES) 148, 180
 X-ray absorption spectroscopy (XAS) 173
 X-ray diffraction (XRD) 2, 48, 61, 66, 79, 95, 113, 196, 204, 216, 218, 235, 236, 277

