

Index

a

abrasive stripping voltammetry 186–189
 acetic acid, Kolbe electrolysis 246, 247
 acetoacetic ester (3-oxo-butyric acid ethyl ester) 251–253
 acetone electrochemical bromination 253–255
 acetyl acetone (pentane-2,4-dione) 247, 248
 anodic dimerization 248
 electrolysis of 247–250
 AC polarography 191, 192
 aeration cell 138–139
 Ag/Ag⁺-electrode 19
 aluminum, electrochemical oxidation 244–245
 amperometric indication 170, 175
 amperometry 172–178
 analytical electrochemistry
 abrasive stripping voltammetry 186–189
 amperometry 172–178
 anions polarography 189–191
 anodic stripping voltammetry 183–186
 bipotentiometric titration 163–165
 conductometrically indicated titration 165–167
 coulometric titration 170–172
 electrochemical methods 155
 electrogravimetry 167–169
 ion-sensitive electrode 156–158

polarography

 advanced methods 182–183
 fundamentals 178–182
 potentiometrically indicated titrations 158–163
 tensammetry 191–196
 aniline 110–115
 anion polarography 189–191
 anodic stripping voltammetry 183–186
 aromatic hydrocarbon 107–110
 autocatalysis 31

b

bipotentiometrically indicated titration 163–165
 Bode plot 135
 bromatometric 172
 Butler–Volmer equation 73, 149, 150
 button cell, impedance 234–236

c

calibration curve 20, 22–25, 89, 156, 157, 181, 183, 184, 186
 cementation reaction 142, 143, 230, 241–242
 charge transfer resistances 150, 235
 charge transport, in electrolyte solution
 charging supercapacitors 221–224
 chemical constitution and electrolytic conductance 54–56
 chlor-alkali electrolysis 258–260
 chloride determination 159–160
 chronoamperometry 121–123

- chronocoulometry 122–124
 - complex plane plot 135
 - concentration cell 28, 29, 139–140
 - conductance titration 51–54
 - conductometrically indicated titration 156, 165–167
 - conductometric titration 165, 167
 - constitution isomerism 54
 - copper ions 46, 140, 142, 152, 168, 242, 251
 - corroding electrodes
 - cyclic voltammetry 143–145
 - impedance of 148–150
 - Tafel plot 145–147
 - corrosion cells 136–138
 - corrosion current 146
 - corrosion inhibition 147
 - efficiency 147, 148, 150
 - corrosion measurements 137
 - corrosion resistance 150
 - Cottrell equation 121, 123
 - coulometric titration 170–172
 - counter electrode 3, 7, 74, 76–78, 84, 103, 112, 115, 132, 144, 146, 151, 153, 175, 178, 182, 187, 194, 198, 199, 207, 243
 - current–cell voltage data 220
 - current–potential curve 7, 36, 39, 72–75, 143, 176, 179, 212, 214, 215
 - cyclic voltammetry 2, 75–82, 186
 - aniline and polyaniline 110–115
 - aromatic hydrocarbon 107–110
 - corroding electrodes 143–145
 - executions 77–82
 - of formic acid 78, 81
 - fundamentals 76–77
 - kinetic investigations 86–90
 - microelectrodes 92–96
 - nickel wire electrode 81–82
 - in nonaqueous solutions 102–104
 - numerical simulation 90–92
 - organic molecules 96–102
 - platinum electrode 80–81
 - results of 90
 - sequential electrode processes 104–107
 - slow scan cyclic voltammetry 82–86
 - supercapacitor electrode 118–121
 - tasks 75–76
- d**
- data recording 9–10, 154, 224, 226, 233
 - DC polarography 70, 180, 182, 190, 191
 - Debye–Hückel theory 19
 - decomposition voltage 34–39, 181
 - degree of dissociation 48
 - dehydration 68
 - 3,4-diacetyl-hexane-2,5-dione 247, 248
 - diaphragm process, chlor-alkali
 - electrolysis 258–260
 - differential potentiometric titration 27–30
 - digital instruments 7
 - digital multimeters 7
 - 2,6-dimethylaniline 96, 99, 101
 - 2,5-dioxo-hexane-dicarboxylic
 - acid-(3.4)-diethyl ester 251, 252
 - 6,10-diphenylanthracene 107
 - discharge behavior 233–234
 - discharge capabilities 224
 - discharging supercapacitors, electric
 - energy 224–226
 - double layer 80
 - double-layer capacitance 119, 148, 149, 192, 193, 235
 - double-layer capacitor 119
 - dropping mercury electrode 180
- e**
- electrochemical cells 7–9
 - electrochemical double layer 119
 - electrochemical energy conversion and
 - storage
 - button cell impedance 234–236
 - charging supercapacitors 221–224

- discharging supercapacitors 224–226
 - fuel cell data 218–221
 - galvanostatic polarization curves 237–240
 - lead–acid accumulator 211–216
 - lithium-ion battery 228–230
 - nickel–cadmium accumulators
 - constant load 233–234
 - discharge behavior of 216–218
 - low-temperature discharge behavior 230–233
 - potentiostatic polarization curves 236–237
 - zinc–air cell 227–228
 - electrochemical energy storage systems,
 - Ragone diagram of 221, 222
 - electrochemical interface 1, 11, 76, 179, 202, 204, 237
 - electrochemical methods 1, 2, 110, 114, 118, 155, 156, 158, 172, 193, 197, 241
 - electrochemical production
 - acetoacetic ester (3-oxo-butyric acid ethyl ester) 251–253
 - acetone electrochemical bromination 253–255
 - acetyl acetone electrolysis 247–250
 - aluminum, electrochemical oxidation 244–245
 - cementation reaction 241–242
 - chlor-alkali electrolysis 258–260
 - ethanol, electrochemical iodination 255–257
 - galvanic copper deposition 242–244
 - Kolbe electrolysis of acetic acid 245–247
 - malonic acid diethylester, anodic oxidation 250–251
 - potassium peroxodisulfate 257–258
 - electrochemical series 11–14, 167
 - electrochromism 111, 114, 207–208
 - electrode cell 212
 - electrode impedance 133–136
 - electrode potential 174
 - and mean activity coefficient determination 19–20
 - evaluation 18
 - executions 17–18
 - fundamentals 15–17
 - procedure 17–18
 - setup 17
 - tasks 15
 - electrode reaction 5, 12, 15, 16, 25, 28, 35, 38, 73, 87, 97, 115, 122, 131, 133, 138, 170, 175, 178, 180, 182, 191, 192, 230, 237
 - electrodes
 - hydrogen 39–42
 - metal sheet 3
 - normal hydrogen electrode 5
 - relative hydrogen electrode 5
 - silver/silver chloride electrodes 4
 - standard hydrogen electrode 5
 - electrogravimetry 167–169
 - electrolysis, acetyl acetone 247–250
 - electrolysis cell 34, 56, 64, 65, 115, 255, 259
 - electrolytic conductance 43, 49, 51, 52, 54–56, 216, 231
 - electropolymerization 111, 199, 209
 - equivalent circuits 134, 223
 - ester saponification 58–61
 - ethanol
 - electrochemical iodination 255–257
 - ethentetracarboxylic acid ethylester 250
 - exchange current density 91
- f**
- Faraday's Law 56–58
 - $\text{Fe}^{2+}/\text{Fe}^{3+}$ electrode 19
 - ferrocene 102, 103
 - ferrocenium system 103
 - ferroxyl indicator 141
 - Fick's first law 179
 - First Faraday Law 56
 - formaldehyde electroreduction,
 - polarography of
 - Frumkin isotherm 194–196
 - fuel cell data 218–221

g

galvanic copper deposition 242–244
 galvanostatic polarization curves
 237–240
 Gibbs energy 12, 35
 graphite electrode 156, 157, 186, 188,
 229, 230

h

haloform reaction mechanism 253
 hanging mercury drop electrode 116
 H-cell 7, 73, 74, 78, 84, 88, 91, 94, 99,
 102, 105, 108, 111, 121, 123, 144,
 146, 151, 184, 187, 202, 203, 209
 Hittorf transport number 62–67
 hydrogen–dioxygen fuel cell 218, 219
 hydrogen electrode 5, 11–13, 15, 21,
 27, 35, 38–42, 77, 142, 167, 213

i

Ilkovic equation 180
 impedance, corroding electrode
 148–150
 indicator electrodes 27, 28, 163, 164,
 170, 171
 indium-doped tin oxide (ITO) 198
 integral double-layer capacitance 193
 intrinsically conducting polymers (ICP)
 111, 199, 209, 210
 iodide ions determination 161
 ion-sensitive electrode 156–158
 iron surface
 activation 142–143
 passivation 142–143
 iron surface, passivation and activation
 142–143

k

Kohlrausch square root law 50
 Kolbe electrolysis of acetic acid
 245–247

l

lead–acid accumulator 211–216, 218
 charge and discharge curves of 216
 during discharge 212
 electrodes 215

lead determination 176–177
 leakage, supercapacitor 222
 linear polarization resistance 150–152
 lithium-ion battery 228–230
 charging and discharging 229
 low-temperature discharge behavior
 230–233

m

malonic acid diethylester, anodic
 oxidation 250–251
 mean activity coefficient 15–20
 4-mercaptopyridine (4MPy) 203
 mercury film electrode 183
 microelectrodes 92–96
 Mössbauer spectroscopy 208

n

near-infrared (NIR) 200
 Nernst equation 11, 12, 14, 15, 21, 26,
 40, 76, 121, 157, 158, 168, 180
 nickel–cadmium accumulators
 216–218
 constant load 233–234
 discharge behavior of 216–218
 discharge curves of 218
 low-temperature discharge behavior
 230–233
N,N-dimethylaniline 96, 99, 100
N,N,N',N'-tetramethyl-*p*-phenylene
 diamine 104
 nontraditional electrochemistry
 electrochromism 207–208
 Raman spectroscopic monitor
 209–210
 SAM 203, 204
 SERS 200–202
 UV-vis spectroscopy 198, 200
 normal hydrogen electrode (NHE) 5
 Nyquist plot 149

o

ohmic losses, supercapacitor 223
 optically transparent electrodes (OTE)
 198
 oscillating reaction 152–154
 overoxidation 114

overpotential 39
 oxalic acid, oxidation of
 executions 32–34
 fundamentals 31–32
 tasks 30

p

paper electrophoresis
 executions 46–47
 fundamentals 46
 tasks 46
perpetuum mobile 214
 phosphoric acid titration 161
 platinum electrode 15, 17, 19, 26, 28,
 32, 39, 57, 64, 72–75, 77, 79–81,
 86, 88, 91, 99, 100, 102, 111, 114,
 127, 129, 133, 154, 206, 236, 238,
 240, 246, 254
 platinum indicator electrode 25, 27
 polarization and decomposition voltage
 34–39
 polarization curves 151
 polarography 2, 178–183
 advanced methods 182–183
 fundamentals 178–182
 polyaniline (PANI) 110–115, 197, 209
 potassium peroxodisulfate 257–258
 potentiometric methods 21, 156
 potentiometric procedures 43
 potentiometric titration and
 measurement 158
 potentiostatic polarization curves
 236–237
 preaccumulation 184
 Prussian blue 126, 207
 pseudo-capacitance 119
 pseudo-capacitor 119

r

radical-radical coupling 110
 Ragone diagrams 217, 221,
 222, 231
 Raman spectra 209, 210
 Raman spectroscopic monitor
 209–210
 Raman spectroscopy 201

Randles–Ševčík equation 184
 rate-determining 69
 rates of corrosion 146
 reaction enthalpy 37
 reaction entropy 37
 redox titrations 25–27
 reference electrode 5–7, 10, 12, 14, 19,
 21–24, 26, 27, 40, 74, 76, 77, 84,
 91, 102, 104, 108, 112, 122, 123,
 125, 126, 132, 134, 144, 153, 154,
 157, 158, 160, 174, 175, 182, 198,
 199, 213, 239, 240
 relative hydrogen electrode (RHE) 5,
 39–42
 rotating disk electrode (RDE) 124–130
 rotating ring-disk electrode (RRDE)
 130–133

s

sacrificial anode 136
 salt bridge 8
 salt water drop experiment 141–142
 Sand equation 116
 scan rate 76
 self-assembled monolayer (SAM)
 203–205
 self-discharge, supercapacitor 222
 SER spectrum, silver electrode 201
 silver ion concentration 157
 silver/silver chloride electrodes 4
 slow scan cyclic voltammetry
 executions 83
 fundamentals 83
 tasks 82
 standard hydrogen electrode (SHE) 5
 Stern-Geary equation 151
 Stokes friction 62
 styrene 172, 175–177
 styrene titration 176, 177
 supercapacitor electrode 118–121
 surface-enhanced Raman spectra
 (SERS) 200–202
 polyaniline film 210
 SAM 203–205
 symmetry coefficient 91

t

Tafel equation 73
Tafel plots 74, 75, 127, 145–147, 152
Tafel-range 146
Tafel slopes 73, 152
Tensammetry 191–196
throwing power 242, 243
titration curve
 amperometric titration 177
 chloride-and iodide 162
 equivalence point 158–160
 phosphoric acid 162
 potentiometric indicated titration
 161
 precipitation titration 166, 173
transference numbers 62
transition times 115, 116
triangular voltage sweep method 76

u

UV-vis spectroscopy 197–200

v

viscosity 44
voltage–time curves 221, 224

voltammetric method 178
voltammetric techniques 182
voltammograms
 linear scan 187
 single scan 185
voltamperometry 178

w

Warburg impedance 235
Weston cell 17
working electrode 7, 8, 74, 76–78, 84,
 93, 103, 112, 122, 126, 133, 134,
 146, 151, 178, 182, 186, 187, 209,
 239

x

x-t-recorder 212, 217, 231, 233

z

zinc–air cell 227–228