# Subject Index

## A

Acetic acid, conductivity, 23 Adhesive bond, 328 Aerosol containers, internally coated, 428 Aluminum amphoterism, 205 anodized impedance, 37 statistical process control, 313 corrosion, 1 EIS evolution during porous anodic film sealing, 255 inhibition, silicate polymerization effect, 205 thin films, corrosion, 276 Aluminum alloys, localized corrosion, detection and monitoring, 297 Aluminum/methanol systems, impedance data, 154 Aluminum/methanol/water systems, impedance data, 154 Aluminum oxide film, 276 Aluminum/polymer laminates, equivalent circuit modeling, 328 Amino-trimethyl phosphonic acid, 192 ANALEIS, 37 Anodic reactions, 9 Anodizing, process control, 313 Artifacts, 73

## B

Barrier stages, zinc-rich paints, 438 Bode magnitude, 428 Bode phase, 428 Bode plots, 255 Breakpoint method, 407 Buried structure, electrochemical impedance, 347

# С

Capacitance, double layer, 407 Carbon steels, differential corrosion, 237 Cathodic disbonding, 407 Cathodic protection, zinc-rich paints, 438 Cathodic reactions, 9 Charge transfer control, 37 Charge transfer kinetics, 9 Chi-square, 428 Chronoamperometry, 450 Circuit models, 23 aluminum/polymer laminates, 328 corroding film-covered metal, 173 corrosion prediction, 192 parasitic conduction pathways, 73 RC model, 54 Coatings accelerated testing, 463 improved testing and evaluation, 463 internally coated steel aerosol containers, 428 loss of adhesion, 407 see also Paints CO<sub>2</sub> corrosion, 237 Concrete, steel in, 1 counter electrode polarization effects, 365 electrochemical impedance and harmonic analysis, 384 Container service lifetime, 428 Copper-nickel alloys, corrosion resistance, 220 Corrosion, 1 aluminum, 1 thin films, 276 differential, carbon steels, 237 electrochemical impedance spectroscopy, data analysis, 37 film-covered metals, 173 high impedance systems, 154 local buried structure, 347 detection and monitoring, 297 model polarization curves, 9 monitoring, 54, 347 potential electrochemical noise, 205 steel in concrete. 384 prediction from circuit models, 192

Corrosion (cont.) rate, steel in concrete, 384 resistance copper-nickel alloys, 220 extremes, 428 steel in concrete or soil, 1 Corrosion inhibitors, 1 carbon steel in seawater, 237 high-performance protective coatings, 450 silicate polymerization, 205 testing and evaluation, 192, 463 Corrosion-product film, corrosion resistance, 220 Counter electrode, polarization effects, 365 Cracking, stress-corrosion, 94 Crosslinking, 463 Cure, coatings, 463 Current distribution, 365 primary and secondary distribution, 347

#### D

Dealloyed layers, coarsening characterization, 94 Deconvolution, Kramers-Kronig transformation, 115 Diffusional impedance, aluminum thin film corrosion, 276 Distributed parameter system, 347

#### E

Electrochemical impedance spectroscopy aluminum anodizing statistical process control, 313 aluminum/polymer laminate equivalent circuit modeling, 328 aluminum thin film corrosion characterization, 276 analysis by systematic permutation of data points, 54 counter electrode polarization effects of steel in concrete, 365 data analysis, corrosion, 37 electrochemical noise, 205 evolution during porous anodic film sealing on aluminum, 255 high-performance protective coatings, 450

improved testing and evaluation of coatings, 463 internally coated steel aerosol containers, 428 interpreting from segmented electrode arrangements, 237 Kramers-Kronig relations application, 115 localized corrosion, detection and monitoring, 297 loss of adhesion of organic coatings, 407 parasitic conduction pathways, 73 steel in concrete, 384 validation by Kramers-Kronig transformation, 140 zinc-rich paint protection mechanisms, 438 Electrochemical noise, inhibitor system study, 205 Electrodes impedance, low conductivity media, 23 kinetics, polarization curves, 9 porous, coarsening of dealloyed layers, 94 segmented arrangements EIS interpretation, 237 Electrolyte resistance, 23 Equivalent circuits. see Circuit models Error structure, frequency-dependent, 115

# F

Faradaic relaxation phenomena, 23
Film-covered metals, impedance, 173
Film-induced cleavage, coarsening of dealloyed layers, 94
Films

corrosion-product, 220
hydration, 255
porous anodic sealing, EIS evolution during, 255
surface, corrosion, 173
unstable, electrochemical noise, 205

Fusion-bonded epoxy

evaluation, 450
loss of adhesion, 407

## G

Galvanic effects, 237

Harmonic analysis, steel in concrete, 384 High impedance systems, data validation using Kramers-Kronig transformation, 154 Hydration, open circuit potential, 276 Hydrothermal sealing, porous anodic films on aluminum, 255

#### I

Impedance spectra, calculated from polarization curve, 9 Interface modeling, 54 Interface regulating device, Kramers-Kronig transformation relation, 140 Iron, corrosion inhibitor evaluation.

192 192

# K

Kramers-Kronig transformation, 1 application in EIS, 115 high impedance system data validation, 154 relation to interface regulating device, 140

#### L

Laminates, equivalent circuit modeling, 328 Low conductivity media artifacts, 73 electrode impedance, 23 parasitic conduction pathways and EIS measurements, 73 Luggin capillary, 23

#### Μ

Marine-service epoxy, evaluation, 450 Mass transfer control, 37 Measurement models, Kramers-Kronig transformation, 115 Measuring area, 347 Metal coatings, 1 Metal matrix composites, localized corrosion, detection and monitoring, 297 Metals, film-covered, impedance, 173 Metastable pitting, 276

## Ν

Nitrate, aluminum inhibition, 205 Nyquist plots, 428 Nyquist representation, 54

# 0

Organic coatings, loss of adhesion, impedance, 407 Oxide capacitance and resistance, 276

# P

Paints improved testing and evaluation, 463 zinc-rich, protection mechanisms, 438 Palladium sputter-coating, corrosion product, 220 Parasitic conduction pathways, electrochemical impedance spectroscopy, 73 Passivation, Kramers-Kronig transformation, 140 Passivity, 276 Permutation technique, 54 Phase angle, 297 Pipelines electrochemical impedance, 347 loss of adhesion of organic coatings, 407 Pit capacitance, 276 Pitting, 37, 297 Polarizability, 365 Polarization curve, impedance spectra calculated from, 9 Polarization resistance, 347 corrosion prediction, 192 Polyimide, evaluation, 450 Polymer coatings high-performance, 450 impedance behavior, 37 loss of adhesion, impedance, 407 Pore electrolyte, corrosion-product film, 220 Potential distribution, impedance measurements, 23 Potentiodynamic polarization, aluminum anodizing statistical process control, 313 Pretreatment, coatings, 463

#### R

Repassivation, 276 Rotating cylinder electrode, 192

#### S

Salt spray test, 313 Silicate polymerization, aluminum inhibition. 205 Simulation, ANALEIS, 37 Sodium chloride, concrete effects, harmonic analysis, 384 Software, ANALEIS, 37 Stability, Kramers-Kronig transformation, 140 Steel cathodic protection, zinc-rich paints, 438 in concrete corrosion. 1 counter electrode polarization effects, 365 electrochemical impedance and harmonic analysis, 384 in soil, corrosion, 1 corrosion inhibitor evaluation, 192 internally coated aerosol containers, 428 loss of adhesion of organic coatings, 407 in water, artifacts, 73

Stern-Geary constant, 384
Stress-corrosion cracking, correlation with coarsening of dealloyed layers, 94
Surface diffusion, coarsening of dealloyed layers, 94
Surface films, corrosion, 173

# Т

Tafel slopes, 384 Theta phase precipitates, 276 Transmission line theory, 328 Transpassive dissolution, Kramers-Kronig transformation, 140

#### V

Validation criterion, Kramers-Kronig transformation, 140

#### W

Weld corrosion, 237 Welded joints, differential corrosion, 237

## Z

Zinc-rich paints, protection mechanisms, 438