

Index

A

ABA triblock copolymers, 238, 249
AB block copolymers, 238, 249
Acrylonitrile-butadiene rubber (NBR), 296
Actuation, dielectric, 255
Agarose, 223–226
Agarose–gelatin, 226
Amino acids, 211
Artificial neural networks (ANN), 6, 7
Asperity, 106

B

Bis(triethoxysilylpropyl)tetrasulfide (BTESPT), 286
Bjerrum length, 193
Bravais lattice system, 269
Brominated butyl rubber (BBR), 311
Bromo-butyl rubber, butyl imidazole, 253
Butadiene, 242, 291, 295
Butadiene-styrene-vinyl pyridine rubber, 295
1,4-Butanediol, 249
Butyl rubber (BR), 311, 381

C

Carbon black, 4, 71, 82, 129, 157, 159, 207, 244, 291, 319
Carbon nanotubes (CNT), 268, 279, 291, 299, 319, 322
Carboxylated nitrile butadiene rubber (XNBR), 240, 255, 296, 300–302
Carboxylated styrene butadiene rubber, soy protein reinforced, 243
Cauchy–Green tensor, 19
Chen–Acrivos equation, 175

Compounding, 324
Contact mechanics, 103, 105
Continuum damage mechanics (CDM), 1, 16
Cracks, dissipation rate, 373
 growth, 326, 346
 initiation, 361, 386
 propagation, 361
 pure shear (PS), 365
 single-edge-notched tension (SENT), 365
 tip blunting, 363
 tip-opening displacement (CTOD), 369
 trouser, 365
Creep, 24, 71, 245
 rate, 24
 response, 90, 94
 tests, 88, 90, 98
 torsional, 71, 90, 99
Crosslinking, ionic, 235
 proteins, 187
N-Cyclohexyl-2-benzothiazolsulfenamide (CBS), 323

D

Dendrimers, 238, 249
Dewetting, 118, 126, 127, 136, 139, 151
Diffusion-limited aggregation (DLA)
 clusters, 207
Dimethylolpropionic acid, 249
Dioctyl phthalate (DOP), 323
Diphenylmethane diisocyanate, 249
Dough, starch-filled gluten network, 218
Dynamic flocculation model (DFM), 325, 338
Dynamic mechanical analysis (DMA), 325
Dynamic moduli, 72, 78, 98, 157, 167, 176, 180

E

- Einstein–Smallwood equation, 205
- Elastic modulus, 112, 117, 188, 205, 216, 224, 243, 256, 340
- Elastic–plastic fracture mechanics (EPFM), 368
- Elastomers, 1, 187, 239, 319
 - composites, 319
 - filled, 4
 - ionic, block copolymer, 249
 - carboxylated, 239
 - polyurethane, 247
 - ionomeric, 235
 - reinforced, 187
 - rigid, 4
 - uncrosslinked, 236
 - unfilled, 3
- Energy balance, 16, 361, 373, 394
- Entangled bound rubber tube (EBT)
 - model, 287
- Entanglements, 201
 - sliding, 202
- Epoxidized natural rubber (ENR), 289
- 2,2'-(1,2-Ethenediyl)bis{5-[4-(9-[[4'-(4-allyloxybenzoyl)-oxybiphenyl-4-yl]oxycarbonyl]nonanoyloxy)phenyl]azo}-benzenesulfonate
- Ethylene propylene diene terpolymer (EPDM), 243, 381
- Ethylene vinyl acetate (EVA) rubber, 308
- Excluded volume, 191
- Extended non-affine tube model, 1
- Extensibility, finite, 7, 190, 199, 202, 340, 344
- Extension test, uniaxial, 21, 57, 59

F

- Fatigue, 72, 260, 361, 383
 - crack growth (FCG), 378, 380
- Fillers, 1, 157, 175, 336
 - hybrid, 336
 - network breakdown, 208
 - rigid, 157, 175
- Finite element method (FEM), 1, 105
- Flocculation, 71, 79, 88, 98, 338
- Flory–Rehner theory, 252
- Fluid film rheology, 151
- Fluoroelastomers (FKMs), 302
- Food networks, 187, 211
- Fracture, 361
 - mechanics, 319
- Free vibration, 100

- Friction, and wear properties, 319
 - heating, 151
 - stationary, 327
- Functionalization, 267

G

- Gas adsorption, static, 319, 323
- Gas permeation, 312, 319, 327, 344, 357
- Gaussian networks, 196
- Gelatin, 224
- Gels, lubricated sliding contact, 117
 - water-based, 222
- Glass, dry/wet friction, 355
 - surfaces, rubber friction, 134
- Gliadins, 214
- Gluten, 187
- Glutenins, 214
- Graphene, 267, 269
 - multilayer (MLC), 319
 - nanoplatelet (GNP), 319
 - zigzag, 273
- Graphene oxide, reduced (rGO), 284
 - /ethylene propylene-diene rubber (EPDM), 310
 - thermally exfoliated (TEGO), 285
- Graphite, 267, 269
 - epitaxial, 272, 277
 - expanded, 269
 - nanoflakes, 269
 - nanoplates, 269
 - nanosheets, 269
 - ultrafine (UG), 319, 321
- Graphite oxide, 268, 276
- Guth–Gold equation, 175

H

- Heat release rate (HRR), 305
- Helmholtz free energy function, 11
- Highly oriented pyrolytic graphite (HOPG), 269
- Homopolymers, 190
- Hydrodynamic reinforcement factor, 171
- Hydrogels, 187, 199, 252
- Hyperelasticity, 1, 7, 14
- Hysteresis friction, 350

I

- Interpenetrating network (IPN), 256
- Intrinsic strength tester, 388
- Ionenes, 238

Ionomers, 237
 Isoprene rubber (IR), 381

J

Jamming transition, 97
 J-integral, 375

K

Klüppel–Heinrich theory, 350
 Kohlrausch–Williams–Watts time behavior, 167
 Kuhn length, 190
 Kuhn segments, 159, 169, 176, 180

L

Leakage, rubber seals, 103, 113, 115, 324
 Length scales, 111
 Lenses, tunable, 255
 Linear–elastic fracture mechanics (LEFM), 369
 Liquid crystal polymers (LCP), 251
 Loading frequency, FCG, 385
 Loss modulus, 170, 178

M

Model-free approach, 7
 Multihysteresis, 343
 Multilayer graphene (MLC), 319
 Multiscale theoretical approach, 157

N

Nanocomposites, graphene/graphite, 283
 Navier–Stokes equations, 116
 Nitrile butadiene rubber (NBR), 240, 296, 323, 381

P

Paris–Erdogan plots, 348
 Payne effect, 5, 72, 90, 159, 208
 Permittivity, dielectric, 256, 257, 304
 Persson rubber friction theory, 108, 139
 Phantom chain model, 198
 Phase separation, 187
 Physical ageing, 90
 PMMA, 117, 130, 133, 134, 152
 Poly(diallyldimethylammonium chloride), 286

Poly(glycerol–sebacate) (PGS), 257
 Polybutadiene (BR), 381
 Polycaprolactonediol, 249
 Polychloroprene (CR), 381
 Polydimethylsiloxane (PDMS), 256, 312
 Polyelectrolytes, 193, 217, 229
 Polymer localization, 157
 Poly[styrene-*b*-(ethylene-*co*-butylene)-*b*-styrene] (SEBS), 249
 Polyurethane (PU), 247, 304
 Protein–polysaccharide mixtures, 226
 Proteins, crosslinking, 187, 194, 211 wheat, 214

Q

Quenched disorder, 188

R

Random copolymers, 194, 212, 238, 296
 Reinforcement, 71
 fractal aggregates, 207
 hydrodynamic, 205
 Rivlin–Thomas approximation, 375
 R-ratio, 382
 Rubber, 71, 187, 267, 361
 composites, 157
 elasticity, 198
 filled, 90, 174, 204
 friction, 103, 104, 117, 350
 ideal, 194
 natural (NR), 284
 particle-reinforced, 96
 self-healing, 235, 253
 standard model, 194
 unfilled, 167

S

Salt, 187, 216
 Seals, 103, 304, 356
 leakage, 113
 SEPDMs, 244, 247, 258
 Shape memory polymers (SMPs), 256
 Silicone rubber, 312
 amino-and carboxylic-functionalized, 256
 Sliding friction, 104
 Small strain creep tests, 88, 90
 Sol–gel transition, 223
 Solution-polymerized styrene butadiene rubber (S-SBR), 86, 160–184, 323, 345, 352

Starch, 218
Stone–Wales defect SW, 275
Storage and loss moduli, 170, 178
Strain-induced crystallization (SIC), 286
Stress softening, 3, 5, 7, 16, 29, 31, 335, 338, 344
Stretch zone width (SZW), 369
Styrene butadiene rubber (SBR), 270, 291, 366
Surface forces apparatus (SFA) measurements, 151
Surface roughness, 103
 power spectra, 130
Swelling, 199

T

Tearing energy, 326, 348, 363, 377, 386–390
Temperature dependency, 1
Thermally exfoliated graphene oxide (TEGO), 285
Thermoelasticity, 41
Thermoresponsive materials, 235, 258
Thermoreversibility, 252
Thermoviscoelasticity, 41, 56
Three-branch test, 62
Time–temperature superposition, 98, 163
Torsional creep, 99
Tube model, 1, 201

U

Ultrafine graphite (UG), 319, 321
Uniaxial extension test, 21, 57, 59

V

Valanis–Landel hypothesis, 7
Vibration, 100
Viscoelasticity, 1, 15, 41, 71, 76, 123, 369, 374, 385
 isothermal, 16
Vulcanization, 3, 74, 83, 253, 284, 303, 324

W

Waveform, 383
Wear, 361
 dynamic, 390
 GNP composites, 356
Wheat, proteins, 214
Williams–Landel–Ferry (WLF) approach, 352
Windows, noise-reducing, 255

Z

Zigzag graphene, 273
Zinc carboxylate polymer, 242
Zinc sulfonated EPDM-based ionomers (Zn-SEPDMS), 244, 258