

Index

a

- accelerating model 14, 15
- additive manufacturing (AM) 234, 235, 272, 277
- Akron Extruder M-PAK150 239
- amorphous polymers 9, 215, 216, 324
 - properties of 9
- angular potential, of coarse-grained PVA model 285, 287
- anisotropic polymer melts 255
 - injection moulding 264–266
 - preferred anisotropy level evaluation 256–258
 - sheared polymer melts 260–264
- atactic PP (aPP) 34, 35
- Avrami analysis 96
- Avrami equation 16, 17, 92, 93
 - parameters 93
- Avrami index 92, 93, 95, 96

b

- benzoate derivatives 44
- benzoate salts 44
- bimodal polyethylene materials 98
- binder jetting (BJ) 234, 235
- biobased nucleators 134
- biocomposites based on biopolyethylene (BioPE) 238
- biodegradable biopolymers 130, 136
- bioplastics 124, 131
- 1,3:2,4-bis(3,4-dimethylbenzylidene)sorbitol (DMDBS) 44, 45

- blow moulding procedure 5
- bone engineering 220–221

c

- calcite 43
- calcium stearate (CaSt) 47
- Ca-pimelate 46
- carbon black (CB) 238, 247
 - containing ethylene-octene copolymer 329
- carbon fibre reinforced plastic (CFRP)
 - waste recycling 344
- carbon nanotubes reinforced crystalline composites
 - future prospects of 344–345
- Carreau–Yasuda parameters 93
- Cartesio 3D printer 239
- cast film extrusion of iPP homopolymer 56
- cellulose fiber reinforced PU polymer matrix 330
- cellulose nanocrystal (CNC)
 - in PCL crystallinity 204
 - reinforced poly(butylene succinate-*co*-1,2-decylene succinate)-(PBDS) 325
- cellulose nanofibers (CNF) 246
 - as nucleating agent for PLA 134
- CF reinforcement effect 247, 329
- chain-folding principle, of polymer crystallization 286, 288
- chemical recycling process 340–343

- chemical structures, of repeating units of polymer 1
- chitosan methyl phosphonate (CMP) 134
- Cinquasia red 46
- classical nucleation theory 99
- classical Ozawa, Flynn and Wall (OFW) method 26
- classical thermodynamic nucleation theory 285–286
- clay-induced nucleation, on PLA sample 132
- CNT nanofiller 111
- ¹³C nuclear magnetic resonance (NMR) spectroscopy
- polymer characterization method 39
- co-crystallization 35, 49, 103–109
- composite filaments 236, 241–243, 245
- compression moulding 140, 245
- computer-aided design (CAD) files 233
- computer software 233
- consistency constant 93, 95
- Continuous-Cooling-Curve (CCC)
- diagrams 52, 108
- copolymers, crystalline polymers 233
- core-shell filaments 239
- Craftbot Plus (Craftbot ltd, HU) printer 238
- crystalline PA66 based glass fiber filled composite 341
- crystalline polymer composites 326
- automotive applications of 331–334
 - biomedical applications of 334–335
 - civil engineering applications 339
 - defense and aerospace applications of 335–339
 - electronics 339
 - environmental impact and safety issues of 343–344
 - filler/reinforcing agent size and type influence on 328
 - future trends of 344
 - with inorganic based reinforcement materials 329–330
 - marine applications 339
- with natural reinforcement materials 330–331
- with organic based reinforcement materials 328–329
- reinforcement materials 323
- technological residence level (TLR) 345
- crystalline polymers 2
- applications 8–9
 - categories of 323
- crystalline regions 215
- crystallisation analysis fractionation (CRYSTAF) 103, 104
- crystallization enhanced development mechanism 4
- crystallization process 13
- measurement methods 13
- d**
- deaccelerating model 14–15
- degree of crystallinity 3, 324
- chain crosslinking 324
 - cooling rate of melt-phase polymer 325
 - density of polymers 324
 - molecular weight 324
 - reinforcement presence 325
 - tacticity 324
- density function theory (DFT) 99
- dibenzylidene sorbitol
- in polycaprolactone 270
 - in polyethylene 268–270
- dibenzylidene sorbitol (DBS) 180–181, 266, 268–271, 277
- differential scanning calorimetry (DSC) 14, 103, 246
- application 15
 - basic principle 14–15
 - plots of pure PLLA and PLLA/PDLA blends 170
- differential thermal analysis (DTA) 246
- diffuse interface theory (DIT) 99
- dimethyl 5-sulfoisophthalate sodium salt (SSIPA) 133

- dioctyl phthalate (DOP) plasticized PLLA
182
- direct digital manufacturing (DDM) 272
- disordered molecular segments 89
- dispersion behaviors, of layered clay
particles 327–328
- double notched impact strength, of
non-nucleated and β -nucleated iPP
homopolymers 46
- e**
- elastic modulus 136–137, 139, 182,
215
- electron spun triethoxysilane-terminated
PCL (PCL-TES) - bioactive glasses
(BG) fiber composites 203
- equivalent undeuterated system, shear
flow on crystallization behaviour
of 263
- expandable drug delivery system 224
- f**
- fast scanning chip calorimetry (FSC) 48,
49, 55, 63, 64
- feed spacers 242
- fermentation process 121, 124
- fiber reinforced crystalline polymer
composites
- future prospects of 344–345
- fiber spinning 59
- Filabot EX2 commercial extruder 237
- finite-extensible nonlinear elastic (FENE)
Lennard-Jones coarse-grained
polymer model 285
- flow-induced polymer crystallization
283, 301–308
- flow-induced polymer nucleation
301–306
- foam-over-wire (FOW) embolization
device 226
- four-armed diblock copolymers of
poly(ϵ -caprolactone)-*b*-poly
(D-lactic acid) (*4a*-PCL-*b*-PDLA)
202
- Fourier-transform infrared spectroscopy
13
- full notched creep test 95
- fused deposition modeling (FDM) 224,
234–244, 247–248, 272, 273
- fused filament fabrication (FFF) 234
3D printing process 238
- fused granular printing 273
- g**
- gastric retention 222, 224
- gastroretentive drug delivery systems
(GRDDSs) 222
- Gibbs free energy variations 99
- Gigabot X 240
- glass fiber embedded crystalline Elium
thermoplastic composite 341
- glycerol monostearate (GMS) 47
- GO containing ultra-high molecular
weight PE 329
- grafted lignin, in PLA/PCL blend
205
- grafted polymers on nanofillers 293
chain length effect 293–295
grafting density effect 293
- graphene nanoplatelets (GNPs) 110,
236, 239, 241, 328, 329, 335, 272,
277
- green nanotechnology 345
- h**
- heterogeneous nucleation 13, 20, 49,
124, 126, 133, 134, 144, 208, 288,
289, 291, 295, 305–306
- heterophasic copolymers of iPP (HECOs)
46, 47
- high density polyethylene (HDPE) 239
composites with spherical hollow
sphere CaCO_3 particles 330
- matrix 110
- modified ICP 59
- polymer matrix, GNP incorporation to
329
- highly crystalline polymers 8, 324
properties of 9

- high melting temperature PLLA (hPLLA)
fibres 181
- high melt strength (HMS) PP 42
- human hair-reinforced polymer
composites 330
- i**
- impact resistance 88, 131, 138, 144, 182,
215, 240
- indirect heating methods 218
- injection moulding 6, 57, 58, 123, 130,
131, 140, 183, 234, 244, 264–267
- inorganic nucleating agent 43, 125,
130–133
- intramolecular chain-folding nucleation
286
- intermolecular fringed-micelle nucleation
286, 287, 298
- intramolecular nucleation model
287–288
- iPP blends
with C₂/C_n plastomers 50
with conventional amorphous
ethylene-propylene rubber 49
- spherulitic growth 49, 50
- iPP crystallization and morphology
investigation methods for
home-made instruments 63
microscopy techniques 60, 61
spectroscopy-based techniques
63
- thermal analysis 63
- X-Ray Diffraction 61
- iPP homopolymers
peak-time of crystallization of 49
β-phase formation 41
weight average molecular weight on
flexural modulus 41
- iPP impact copolymers (ICPs) 47
comonomer content variation in EPC
48
- structural parameters for 47
systematic crystallization study 48
- iPP/sPP blends 35–36
- Irgaclear XT 386 46
- isoconversional principle 18, 26
- isotactic polypropylene (iPP) 241
- alpha (α) monoclinic form 37
- beta (β) phase 37
- C₂ content on melting point 39
- crystallinity and polymorphism, chain
structure and molecular weight
effects for 37–42
- crystallization, long-chain branching
(LCB) effect on 42
- enthalpy (diamonds) of C₂C₃ random
copolymers 39
- epsilon (ϵ) form 38
- flow induced crystallisation (FIC) 58,
59
- gamma (γ) phase 38
- and (HD)PE, epitaxy between 52
- matrix crystallization 49
- morphological scales, characteristic
hierarchy of 34
- nucleation of 42–47
- origin of 33
- paracrystalline smectic modification
39
- polymorphism of 34
- processing effects and material
properties 55, 60
- reinforcement for 54
- tacticity influence on 324
- total chain defect content on melting
point 39
- isothermal crystallization 92, 93, 95
behaviour of pure PLLA 167
- isothermal polymer crystallization 15
activation energy characterization
18–19
- analysis 16–17
- crystal geometry 17–18
- performance 16
- polymer composites 19–20
- rate characterization 18
- j**
- jute reinforced polymer composites 330

k

- kenaf fiber reinforced starch-based film 330
Kevlar fibers 237, 329
kinetic term model 14
Kissinger–Akahira–Sunrose (KAS) method 26

l

- lactic acid 121
chemical structure of 162
structure and isomers of 122
lactides, chemical structure of 162
lamellar thickening 125
lamella structure 325
laminated object manufacturing (LOM) 234, 235s
Langevin dynamic simulations 291
Lauritzen and Hoffman theory 164–166
layer-by-layer manufacturing approach 233
LCB-PP 42
Liestritz-Micro-27 237
life cycle assessment (LCA) technique 344
light-depolarizing microscopy technique 96
linear low-density polyethylene (LLDPE) 50, 87–90, 104–106, 239
liquid crystalline polymer
nanocomposites
GPNPs reinforcement to 329
low density polyethylene (LDPE) 239
based MWCNT reinforced composites 342

m

- macromolecule crystallization 123, 125
maleic- and acrylic acid-grafted PP 53
Mankati E360 236
MarkerPi 3D printer 221
Markforged X7 system 236
Matrix filaments 237
mechanical recycling process 340, 341
medical stents 218, 221–222, 224

- metallocene-catalysed heterophasic iPP copolymers, crystallization kinetics of 49
methylene sequence length (MSL) 104
micro-injection moulding 266
miktoarm star copolymer (μ -PEG-PCL-PLLA) 202
modified Ozawa model 23–25
molecular dynamics (MD) simulations 283, 284
coarse-grained polymer model 285, 287
vs. Monte Carlo simulations 284
united atom chain model 285
molecular simulations 283
flow-induced polymer crystallization 301–308
flow-induced polymer nucleation 301–306
grafted polymers on nanofillers
interfacial interactions effect 295
grafted polymers on nanofillers,
crystallization of 293
chain length effect 293–295
grafting density effect 293
interfacial interactions effect 295
nanofiller-induced block copolymer
crystallization 291–292
nanofiller-induced homopolymer
crystallization 288–291
polymer crystallization at quiescent state
crystal nucleation 285, 287, 288
intramolecular nucleation model 287–288
random copolymer nanocomposite
crystallization 293
stereocomplex crystallization of
polymer blends 295–300
chain length effect 297–298
chain structure effect 300
chain topology effect 299–300
nanofillers effect 298–299
simulation details 296–297

- molecular simulations (*contd.*)
- stretching effect 298
 - stretch-induced crystalline structure changes 306–308
 - molecular weight
 - effect on crystallinity
 - poly (p-phenylene sulfide) 324
 - poly(3-hexylthiophene) 324
 - Monte Carlo (MC) simulations 283
 - lattice polymer chain model 284
 - micro-relaxation step 284
 - vs. molecular dynamics simulations 284
 - Morphology Mapping 256, 275–277
 - multi jet fusion (MJF) techniques 237
 - multi-wall carbon nanotubes (MWCNT) 238, 328, 342s
- n**
- NA-21 44–45
- nanocellulose (NC) 203–205
- nanocomposites, PE 109–112
- nanofiller content 109–110
- nanofiller-induced block copolymer
 - crystallization, molecular simulations of 291–292
- nanofiller-induced homopolymer
 - crystallization, molecular simulations of 288–291
- nanohybrid epitaxial brush (NHEB)
 - structure 291
- nanohybrid shish-kebab (NHSK)
 - structure 111, 180, 289–291, 293, 306
- nanosepiolite 132
- natural fibers 134, 139–140, 330, 339, 343
- natural flax fibers reinforced PLA-PBS
 - polymer composite, recyclability of 343
- neutron scattering techniques 256
- N, N'*-bis (benzoyl) hexanedioic acid dihydrazide (BHAD) 133–134
- N, N'*-bis (stearic acid)-1,4-dicarboxybenzene dihydrazide (PASH) 134
- N, N'*-oxalyl bis (piperonylic acid) dihydrazide (PAOD) 133
- non-destructive techniques 2
- non-isothermal crystallization, PE 98–99
- non-isothermal polymer crystallization process 15
- activation energy determination 26–27
- crystal geometry analysis 21
- Jeziorny-modified Avrami equation 21, 22
- Mo model 25–26
- Ozawa model 21, 23–25
- nonlinear crystallization modelling 20
- performance 20
- relative crystallinity analysis 27
- nucleating agents, categorization of 43
- β -nucleating agent 46–47
- nucleating agents, for PLA 127
 - efficiency 130
- inorganic
- carbon nanotubes 132
 - clay 131, 132
 - sepiolite 132
 - talc 130, 131
 - talc and titanium dioxide combination 131
 - talc, calcium carbonate and LAK 131
- organic
- BHAD 133
 - cellulose nanofibers 134
 - chitosan methyl phosphonate 134
 - PAOD 133
 - PASH 134
 - pectin 135
 - SSIPA 133
 - wood flour 134
- nucleating effect, of PCL-grafted-CNC, and non-grafted-CNC 205

- nucleation 99
of iPP 42–47
theory 99
- nylon(s) 8, 233–234, 236, 237, 246–248
- Nylon 6 236–237, 331
- Nylon66 236, 246, 326
- o**
- optically active lactide types 124
- organically montmorillonite (OMMT)
incorporation effect, on PLA/PBAT blend 330
- organic particulate nucleating agents 44
- organophosphate NA-11 44–45
- organophosphates 44
- Ozawa model 21, 23–26, 28
- p**
- PA-6 and iPP 52, 53
- particulate nucleating agents 44–45
- PCL-*b*-PLLA di-block copolymers 202
- PCL-Macaiba fibre composites 206
- PDMAEMA-*b*-PLLA-*b*-PDMAEMA
copolymers 177
- PE/carbon nanotubes 111
- pectin 135
- PEG plasticized PLLA 182
- PET plastic salad containers (rPET)
240–242
- plastic wastes recycling 340
- PLLA-*b*-PCL diblock copolymers 176
- PLLA-*b*-PEG diblock copolymer 177
- PLLA/f-CNFs composites 174
- PLLA/g-CNFs composites 174
- PLLA/GONS composites 174
- PLLA/LDH nanocomposites 172
- PLLA/multiwalled carbon nanotubes
(MWCNTs) composites 173
- PLLA/PDLA stereocomplex 135
- PLLA/PPZn nanocomposites 172
- PLLA/TSOS (trisilanolheptaphenyl POSS)
nanocomposites 175
- PLLA/twice-functionalized organoclay
(TFC) nanocomposites 172
- PLLA/Zinc Oxide (ZnO) composite 174
- polarized optical microscopy (POM)
13–14, 100, 133, 171, 174, 177,
196–197, 200, 205–207, 326
- polyamide nylon (PA12) 234, 237
- polyamides 234–238
composites 237
- foliated graphite crystallization
mechanism 24
- polybutylene succinate structure,
graphene nanosheets
incorporation on 329
- poly(ϵ -caprolactone) (PCL)
based multiphase polymer systems
199–207
crystallization types 199
- biomedical applications 195, 215
- crystallinity 195–198
- degradation rate 196
- molecular weight 195
- rice husk incorporation into 206
- synthesis methods 196
- poly(ϵ -caprolactone) (PCL) crystallization
polymer blends 199
amorphous chlorinated polyethylene
200
- ethylene/octene multiblock
copolymer effect 200
- PCL/crosslinked carboxylated
polyester resin (CPER) binary
blends 200
- styrene-co-maleic anhydride (SMA)
copolymer effect 202
- with starch 199
- behaviour of
bamboo-root flour effect 206
- block copolymers 202, 203
- cellulose nanocrystals on 205
- chitin nanocrystals on 205
- effect of fillers 203–207
- functionalized MWNTs (f-MWNTs)
206
- graphite oxide effect 205
- polyamide 6 (PA6) particles 203
- polymer blends 202
- reduced graphene oxide effect 205

- polydispersity 41–42, 56, 58
 polyesters 1, 6, 123–124, 126, 138–139,
 195–196, 200, 233, 240, 339
 polyethylene (PE) 233, 238–240
 blends and co-crystallization 103–109
 crystallization 91
 simulation based on the united atom
 chain model 285, 286
 crystallization kinetics of
 isothermal crystallization 93–96
 non-isothermal crystallization
 96–99
 nanocomposites 109–112
 nucleation theory 99
 reactor 239
 structure and morphology 87–91
 theory of crystallization and kinetics
 92–93
 poly(ethylene oxide) (PEO)/PLLA
 solution-cast blended films 169
 polyethylene terephthalate (PET) 7, 240,
 241
 Ozawa model for 23
 polyethylene terephthalate glycol (PETG)
 SEP filaments 241
 sepiolite composites 241
 poly(lactic acid) (PLA) 122, 233, 243
 applications 130
 biodegradability 123
 composites, ramie fibers addition 330
 crystallization kinetics, improvement of
 126–130
 annealing 126, 130
 nucleating agent 126, 127
 plasticizers 126, 129
 drawbacks 140
 films 123
 as food packaging material 123
 with malonate oligomers, plasticization
 of 182
 matrix and blends, organic and
 inorganic nanoparticles in 143
 matrix, titanium dioxide-coated flax
 fibers into 330
 molecular weight 121
 natural fiber composites 139–140, 141
 nucleating agents 130–133
 inorganic 130–133
 organic 133–136
 nucleation 130–136
 optical isomers 161
 organoclay nanocomposites 131
 plasticisation 182
 production pathways, from lactic acid
 121–122
 resin quality 123
 poly(L-lactic acid) (PLLA)
 chemical structure 162
 concentration gradient 7–8
 crystal structure 162
 glass transition temperature 162–163
 and graphene nanosheet (GNS)
 composites 174
 hydrolytic degradation 161
 melting temperature 163
 poly(L-lactic acid) crystallization
 in block copolymer 175–178
 calorimetry method 166–168
 classical Lauritzen and Hoffman theory
 164–166
 fullerene (C_{60}) loading 172
 in nanocomposites 172–175
 after nucleating agent addition
 178–182
 BTA-cyclohexyl (BTA-cHe) 180
 1, 3:2, 4-dibenzylidene-D-sorbitol
 180
 N,N' -Bis(benzoyl) suberic acid
 dihydrazide 180
 N,N,N' -Tris(benzoyl) trimesic acid
 hydrazide 181
 N,N,N' -Tris(1H-benzotriazole)
 trimesinic acid acethydrazide 181
 organic salt
 (bistrifluoromethylsulfonyl) imide
 lithium salt 181
 PDLA-*b*-PM-*b*-PDLA triblock
 copolymer 180
 stereocomplex crystallites 179
 PLLA/PCL blend 170

- PLLA/PDLA blend 168, 172
 PLLA/PEG blend 169, 171
 PLLA/POM blend 171
 by solvent evaporation 8
 through spherulite growth 163–164
 poly (L-lactide)-*block*-methoxy
 poly(ethylene glycol)
 copolymer (PLLA-*b*-PEG) 176
 (PLLA-*b*-MePEG) diblock copolymers
 176
 poly (L-lactide)-*block*-poly (vinylidene fluoride)-*block*-poly (L-lactide) (PLLA-*b*-PVDF-*b*-PLLA) 176
 poly (L-lactide)-*b*-poly(ethylene oxide) (PLLA-*b*-PEO) block copolymers
 176
 poly (L-lactide-*b*-2-dimethylaminoethyl methacrylate) (PLLA-*b*-PDMAEMA) copolymers 176
 polymer(s) 215
 blending technique 199
 chains 215
 crystallinity 215
 molecular chains, arrangement of 3
 polymer crystallization
 characterization 15
 crystal growth
 and amorphous phases 103
 chain immobility 100
 characteristic values of 101
 iPP spherulite growth 100
 kinetics 93
 from solution 7–8
 strain-induced 5–7
 polymer simulation systems
 molecular dynamics simulation 283
 Monte Carlo simulation 283
 polymeric stimuli responsive materials 215
 polypropylene (PP) 233, 241, 242
 composites 247
 submicronic-talc composites 330
 polystyrene-*b*-poly (L-lactide)
 (PS-*b*-PLLA) diblock copolymers
 175
 poly(vinyl alcohol) (PVA)
 coarse-grained polymer model 285,
 287
 MWCNT polymer composite 328
 polyvinylidene fluoride (PVDF) matrix 26
 GNFs addition to 329
 pseudo-monoclinic polyethylene 90
- q**
 γ-quinacridone 46
- r**
 RAMAN spectrum 13
 random copolymer nanocomposite
 crystallization, molecular simulations of 293
 random-type morphology 98
 raw materials 234, 237, 240–242
 recycled high density polyethylene (rHDPE) 239
 recycled polypropylene (r-PP) 242
 recycling process
 carbon fiber reinforced crystalline polymer composites 341–342
 carbon nanotubes reinforced crystalline polymer composites 342
 chemical 340
 flax fiber reinforced PA11-PP composites 343
 glass fiber reinforced crystalline polymer composites 340–341
 mechanical 340
 of natural fiber-reinforced crystalline polymer composites 343
 of sisal fiber incorporated PP-PLA composites 343
 thermal 340
 relative crystallinity of PEG 27
 relative crystallinity of PW 27
 Rheomex 252p 239
 Rice husk reinforced rPP filaments 243
 ring-opening lactide polymerization 121

S

- secondary crystallization process 103
 selective laser melting (SLM) 234–235,
 272
 selective laser sintering (SLS) 234–235,
 237, 242, 245
 printing technology 234
 self-nucleation 124, 179
 self-nucleation annealing (SSA) 103–105
 self-seeding 124
 semi-crystalline polymers 1, 8, 92, 100,
 215, 216, 233, 323–325
 crystallinity values of 327
 properties of 9
 shape memory alloy (SMA) 202, 236,
 238
 shape memory effect 215–227
 shape memory materials (SMMs) 240
 shape memory polymers (SMPs) 215,
 227
 biomedical applications of
 bone engineering 220–221
 drug delivery application 222
 medical stents 221–223
 tissue engineering 218, 220
 cryogel scaffolds 221
 mechanism of 217
 self-healing materials 222, 224–226
 shape memory cycle 216, 217
 types of 218, 220
 vascular embolization 226–227
 shape memory stent (SMDES) 222
 sheared polymer melts 260, 264
 with nanoparticles 271–272
 with nucleating agents 266–271
 short carbon fiber (SCF) 236, 242
 short glass fibres 43, 331
 sigmoidal model 14, 15
 single walled carbon nanotube (SWCNT)
 reinforced PP composite 328
 slow crack growth (SCG) 93, 95, 105
 small-angle neutron scattering
 of deuterium labelled polyethylene
 mixtures 260
 sample characteristics used for
 261–262
 small-angle X-ray scattering (SAXS) 103,
 259
 for 3 Cl-DBS/PCL system 271
 for isotactic polypropylene after
 injection moulding 266–267
 PCL extruded filament 275
 for PCL/graphene sample 272
 3D printing of LDPE 275
 sodium benzoate (NaBz) 47
 soluble nucleating agents 43, 45, 58
 solvent evaporation 7, 8, 172
 spherulite structure 203, 325
 spherulites collide 90
 spherulites morphology, of pure PLLA
 and PLLA/CNTs-g-PLLA
 nanocomposites 174
 step crystallisation (SC) 103, 104,
 296–300
 stereo complex crystallite (sc), in
 PLLA/PDLA blends 169
 stereocomplex crystallization, of
 PLLA/PDLA blends 296
 chain length effect 297–298
 chain structure effect 300
 chain topology effect 299–300
 nanofillers effect 298–299
 simulation details 297
 stretching effect 298
 stereolithography (SLA) 233–235,
 272
 stereorandomness 215
 strain-induced crystallization in natural
 rubber 258, 259, 277
 X-ray diffraction study 259
 strain-induced polymer crystallization
 5–7
 stretch-induced crystalline structure
 changes 306–308
 surface free energy, of PE folded-chain
 nucleus 286
 syndiotactic PP (sPP) 34
 form I 35
 form II 35
 form III and IV 35
 limitations 35

t

tacticity 166, 324
 talc 43, 130, 131
 calcium carbonate and LAK 131
 -nucleated iPP compositions 44
 and titanium dioxide combination 131

temperature rising elution fractionation (TREF) 103, 104

temperature term model 14

template crystallisation 259

tensile testing 244

thermal recycling process 340

thermodynamics

- on crystallization of polymers
- characteristics 4–5

thermogravimetric analysis (TGA) 246, 247

thermomechanical pulp (TMP) fibres 238

thermoplastics 93, 130, 144, 218, 248, 273, 331, 340

thermosets 218, 340

3D printed crystalline polymers

- material and process
- nylon and polyamides 234–238
- polyethylene 238–240
- polyethylene terephthalate 240–241
- polylactic acid 243
- polypropylene 241–243

- mechanical properties/characteristics 244–246

- thermal properties/characteristics 246–247

- tribological properties/characteristics 247–248

3D printer 221, 233, 236–243

3D printing

- using extrusion 272–275

- in-situ studies of polymer

- crystallisation 273–275

- using pellet fed extruder system 273

3D spherulitic structure 96

tissue engineering 130, 137, 195,

218–220, 227, 334

transcrystalline layer (TCL) formation

54, 108

1,2,3-tridesoxy-4,6:5,7-bis-O-[(4-propylphenyl) methylene] nonitol 45

u

Ultimaker 2 236

ultrahigh molecular weight polyethylenes (UHMWPE) 88

composite 238

uniaxial deformation experiment, with WAXS patterns 258–259

united atom chain model 284, 285, 308

v

vascular embolization 218, 226

w

WANHAO Duplicator 4/4x 236

water vapor transmission rate (WVTR) 123

wide angle X-ray scattering (WAXS)

- patterns 103

- for BPE and HPE samples 263

- of polyethylene specimens sheared in melt 269

wood-plastic composites 343

x

X-ray diffraction (XRD) technique 2, 13, 60, 63, 169, 200, 202, 206, 258

X-ray scattering technique 96, 256, 265

y

yield stress 215

z

zero shear viscosity 93, 95

Ziegler–Natta catalyst (ZNC)

- based PP random copolymers,

- increasing C₂ content effect in 40

