

Index

a

- acidic zeolites 91
- adamantane 79, 80, 101–105, 116, 117, 120, 123–125, 127, 138–141, 170, 277
- adamantane isomerization
 - process 104, 124, 125
- aerosol shock tube (AST) 441–446
- aerospace fuels
 - basic characteristics 6
 - development 12
 - general properties and requirements
 - density 7–8
 - jet fuel performance
 - prediction 12
 - low-temperature fluidity 8–11
 - thermal oxidation
 - stability 11–12
 - high-energy-density fuels
 - gelled fuels 26–27
 - JP-9 22–25
 - JP-10 22–25
 - RJ-4 21–22
 - RJ-5 22
 - RJ-7 22–25
 - strained and diamondoid
 - fuels 25–26
 - non-petroleum fuels
 - bio-aviation fuels 28–31
 - F-T fuels 28
- aerospace technology 1
- aerospace vehicles 1, 2, 21, 149, 169, 241, 343
- aldol condensation
 - catalyst design 260
 - monocyclic hydrocarbons 256–259
 - multicyclic hydrocarbons 256–259
 - synthesis of branched
 - monocyclic 256–259
- alkyl-adamantanes 103, 104, 117, 127–129, 131, 138–141, 277
- alkylation
 - chain and ring increasing by
 - hydroxyalkylation 244–256
 - chemical synthesis methods 138–142
- alkyl diamondoids
 - via acid-catalyzed
 - rearrangement 102–112
 - via IL-catalyzed rearrangement
 - biomass-derived hydrocarbons
 - rearrangement 134–135
 - polycycloalkanes
 - rearrangement 127–134
 - tetrahydrodicyclopentadiene
 - rearrangement 120–126
 - tetrahydrotricyclopentadiene
 - rearrangement 114–120
 - jet fuels 140
 - properties 142–143
 - via zeolite-catalyzed
 - rearrangement 135–138
- alkyl halides 139, 140
- aviation gas turbine engine
 - fuels 12–14
- aviation transportation 6
- axisymmetric models 356

b

Bingham model 349
 bio-aviation fuels 28–31
 biomass-derived hydrocarbons
 rearrangement 134–135
 1,3-bishomocubane 222
 boron-based nanofluids 315–320

c

C–C coupling reactions 242, 244, 265,
 277
 cedarwood oil 134, 277
 centrifugation method 305–306
 chemical reduction
 method 299–300
 chloroaluminate ionic liquid (IL)
 catalyst 74, 77, 78, 80, 87, 102,
 112, 113, 118
 civil aircraft 7
 commercial zeolites 87, 91
 congressane 101
 constant-volume strand
 burner 447–450
 copper catalytic system 185–187
 cubane 25, 150, 191, 218–221
 current fuels 17–19
 cyclic sesquiterpenes 275
 cycloaddition
 catalysts 44–49
 reaction pathway 40–44
 cyclopentanone 203, 206, 207, 242,
 256–258, 260, 261, 275, 278,
 279
 cyclopropanation
 complete cyclopropanation of P1 and
 P3 196
 of *endo*-DCPD with $(\text{ICH}_2)_2\text{Zn}$ in
 diethyl ether solvent 201–202
 of *endo*-DCPD with monomeric
 IZnCH_2I in diethyl ether
 solvent 197–201
 lithium carbenoid-
 mediated 175–177
 metallic aluminum carbenoid-
 mediated 177–181
 organometallic
 carbenoid-mediated 170–181

samarium carbenoid-
 mediated 174–175
 transition metal carbene-
 mediated 181–190
 ylide cyclopropanation process 190
 zinc carbenoid-mediated 171–174

d

density 7–8, 380
 and energy 322–323
 diamantane 101, 105
 diamondoids 1, 2, 25–26, 87, 101–143,
 150
 diazo compound 170, 183, 187
 diazomethane (CH_2N_2) 183–184, 187,
 190
 dicyanamide (DCA) 346, 378,
 382–397
 dicyclopentadiene (DCPD) 40, 50–67,
 192, 222
 Diels–Alder cycloaddition
 branched mono-cyclic hydrocarbons
 using diacetone alcohol 267
 branched multi-cyclic hydrocarbons
 using 2-MF 265–266
 furfuryl alcohol 267
 multi-cyclic hydrocarbons using
 terpinenes 262–265
 dienophile molecules 265
 3,4-dihydrodicyclopentadiene (3,4-
 DHDCPD) 50
 8,9-dihydrodicyclopentadiene (8,9-
 DHDCPD) 50
 dual-bed catalyst system 278–279

e

energetic hypergolic fuel 169
 energetic ionic liquids (EILs) 2, 379
 excessive condensation 260

f

fine atomization 352, 355
 Fisher–Tropsch (F–T) technology 28
 Friedel–Crafts alkylation 252
 fuel density 5, 7, 152, 258
 fuel/oil heat exchanger (FOHE) 11
 fuel system icing inhibitor (FSII) 17

furfuryl alcohol 254, 267, 268
fused cycle construct 275–277

g

gasoline 5, 12, 13
gelled fuels 26–27
 formulation 341–346
 preparation and
 mechanism 346–348
graphene 305, 306, 333, 335, 380, 439,
 440, 455
green hypergolic ionic liquid
 fuels 377–431
Guerbet reaction 275

h

halohydrocarbons 85, 106
heated shock tube (HST) 441
heat of formation (ΔH_f) 380, 378,
 380–381, 386, 390, 394, 402, 403,
 414, 416, 429
Herschel–Bulkley (HB) model 349
heterogeneous photocatalysis
 mechanism 167–168
 metal-doped TiO₂ 156–161
 metal doping vs. framework Ti
 species 164–167
 modified zeolites 155–156
 Ti-containing MCM-41 161–164
 zinc and cadmium oxides and
 sulfides 155
high-density fuels 2, 3, 5, 6, 8, 15, 22,
 24, 26, 31, 150, 241–283
high-density polycycoalkane fuels
 cycloaddition
 catalysts 44–49
 reaction pathway 40–44
 hydrogenation, of
 dicyclopentadiene 50–67
 isomerisation
 exo-tetrahydrodicyclopentadiene
 one-step synthesis 95–97
 hydrogenation synthesis 90–95
 of tetrahydrodicyc-
 lopentadiene 74–81
 of tetrahydrotricy-
 clopentadiene 81–90

high-energy-density liquid fuel
 gelled fuels 26–27
 JP-9 22–25
 JP-10 22–25
 RJ-4 21
 RJ-5 22
 RJ-7 22–25
 strained and diamondoid fuels 25
high-energy strained liquid fuels
 caged fuels 222–224
 cubane and derivatives 218–221
 cyclopropanation 170
 of *endo*-DCPD with (ICH₂)₂Zn in
 diethyl ether solvent 201–202
 of *endo*-DCPD with monomeric
 IZnCH₂I in diethyl ether
 solvent 197–201
 of *endo*-DCPD with monomeric
 IZnCH₂I in gas phase 193–197
 organometallic
 carbenoid-mediated 170–181
 transition metal carbene-
 mediated 181–190
 ylide cyclopropanation
 process 190
energetic hypergolic fuel 169
heterogeneous photocatalysis
 mechanism 167–168
 metal-doped TiO₂ 156–161
 metal doping vs. framework Ti
 species 164–167
 modified zeolites 155–156
 Ti-containing MCM-41 161–164
 zinc and cadmium oxides and
 sulfides 155
homogeneous photosensitizers
 transition-metal-compound-based
 sensitizer 153–155
 triplet sensitizer 152–153
PCU derivatives 214–218
PCU dimers 210–214
PCU monomer 209–210
quadricyclane fuel 149–170
spiro and caged fuels 202–224
synthesis and mechanism 190–202
 complete cyclopropanation of P1
 and P3 196–197

- high-performance turbine engine
 - technology (IHP/TET)
 - program 19
 - high thermal-oxidative-stability
 - fuels 5, 15–17
 - homogeneous photosensitizers
 - transition-metal-compound-based
 - sensitizer 153–155
 - triplet sensitizer 152–153
 - hydrocarbon fuels 5, 7, 11, 170, 190, 291, 316, 317, 339, 341–343, 345, 360, 437, 461
 - hydrogenation, of dicyclopentadiene
 - catalysts 51–54
 - kinetics 54–67
 - mechanism 50–51
 - hydrogenation process 68, 70, 280
 - hydroprocessed esters and fatty acids (HEFA) fuels 27
 - hydroprocessed renewable jet (HRJ) 31
 - hypergolic ionic liquid fuels 421
 - boronium-based and B–H bonds-rich anions 402
 - development 378–379
 - on dicyanamide anions 382–397
 - on nitrocyanamide
 - anions 397–401
 - physicochemical properties
 - density 380
 - heat of formation 380–381
 - ignition delay time 381
 - specific impulse 382
 - thermal properties 379–380
 - viscosity 380
 - hypergolicity 2, 168, 342, 359, 377, 383, 392, 400, 402–405, 425, 426, 429
- i**
- ignition delay time 292, 332, 356, 359–361, 381, 386, 395, 396, 405, 413, 441, 443, 445–447, 449, 453–457, 459, 460
 - ignition probability 332, 450, 452
 - ignition temperature 291, 292, 439, 450–453, 455
- integrated reaction strategies
 - cellulose co-conversion 283
 - dual-bed catalyst system 278
 - multistep coupling reaction 280–282
 - one-pot reaction 279–280
 - intramolecular alkylation 254
 - isomerisation
 - exo*-tetrahydrodicyclopentadiene 95–97
 - hydrogenation synthesis 90–95
 - of tetrahydrodicyclopentadiene 74–81
 - of tetrahydrotricyclopentadiene 81–90
- j**
- jet fuel 241
 - nanofluids 316–317
 - performance 12
 - jet fuel thermal oxidation tester (JFTOT) 11
 - JP-9 22–25
 - JP-10 22–25
- l**
- laser ignition 447, 449, 460
 - light scattering method 310
 - linear terpene alcohol 263
 - liquid film 354, 439, 439
 - liquid hourly space velocity (LHSV) 62, 64
 - lithium carbenoid-mediated cyclopropanation 175–177
 - low-temperature fluidity
 - freezing point 10–11
 - viscosity 8–10
- m**
- machine learning (ML) 12
 - mechanical mixing 311–312
 - metallic aluminum carbenoid-mediated cyclopropanation 177–181
 - methyl-substituted tetrahydrodicyclopentadiene 104
 - military aircrafts 7, 8, 241
 - multicyclic fuels 25
 - multistep coupling reaction 280–282

n

- nanofluid fuels
 - atomization behavior 352–356
 - centrifugation method 305–306
 - combustion behavior 356–361
 - combustion mechanism 464–470
 - exploration 291
 - gelled fuels 26–27
 - formulation 341–346
 - preparation and mechanism 346–348
 - illustration 292
 - light scattering method 310
 - physical properties
 - combustion
 - characteristics 331–337
 - density and energy 322–323
 - evaporation
 - characteristics 337–341
 - latent heat of vaporization 329–331
 - surface tension 328–329
 - viscosity 323–328
 - rheological behavior 348–352
 - sedimentation balance
 - method 305
 - sedimentation photograph
 - capturing 305
 - single-step method 293–303
 - stability approaches
 - mechanical mixing 311–312
 - pH control 312
 - surface modification 313–315
 - surfactants 313
 - synthesis and properties 292–305
 - three omega method 310
 - typical high-energy
 - aluminum 320–322
 - boron-based nanofluids 315–320
 - UV–Vis spectrophotometer 308–309
 - ζ-potential measurement 306–308
- non-petroleum fuels
 - bio-aviation fuels 28–31
 - F-T fuels 28

o

- octanitrocubane (ONC) 220
- oligomerization, ring increased by 267

- multicyclic hydrocarbons using cyclenes 271–272
- multicyclic hydrocarbons using pinene 269–271
- organometallic carbenoid-mediated cyclopropanation 170–181
- oxygenated terpenoids 264

p

- palladium catalysts 190
- PCU dimers 210–214
- PCU derivatives 214–218
- PCU monomer 209–210
- petroleum refinery industry 1
- photoassisted conversion 154
- physical vapor deposition (PVD) 293–298
- pinene 242, 262, 263, 269–271
- polycycloalkanes
 - rearrangement 127–134
- polycycloalkane fuels 2, 39–97

q

- quadricyclane fuel 149–170

r

- rapid compressor 439–441
- reductive coupling 203, 204, 274
- rhodium compounds 187
- Robinson annulation 272–274
- Russian aerospace fuels 15

s

- samarium carbenoid-mediated cyclopropanation 174–175
- sedimentation balance method 305
- sedimentation method 305
- shock tube 441–446
- single-step method
 - chemical method
 - chemical reduction method 299–300
 - precipitation method 300–303
 - physical methods
 - physical vapor deposition 293–298
 - wet mechano-chemical techniques 298–299

- specific impulse (I_{sp}) 169, 337, 341, 360, 378, 382, 386, 395, 409, 420, 423
- spiro and caged fuels 202–224
- stable boron-in-jet fuel
nanofluids 316–317
- surface tension 328–330, 333, 411, 437
- synthesis chemistry 1, 2
- t**
- terpinenes 262–265, 269–271
- tetrahydrodicyclopentadiene (THDCPD) rearrangement 101, 102, 120–126
- tetrahydrotricyclopentadiene (THTCPD) rearrangement 114–120
- tetranitrocubane (TNC) 220, 221
- thermal oxidation stability 11–12
- three-omega method 310
- traditional carbon–carbon coupling methods 150
- transition metal carbene-mediated cyclopropanation
cobalt(II) complexes 189
copper catalytic system 185–187
diazomethane system 183–184
rhodium compounds 187
- transition-metal-compound-based sensitizer 153–155
- tricyclopentadiene (TCPD) 24, 40, 67–74
- turbojet 5, 12, 15
- turpentine 242, 262, 264, 269–271
- two-step method 293, 303–305
- u**
- ultrasonication 311, 312, 320, 321
- UV–Vis spectrophotometer 308–309
- v**
- viscosity
hypergolic ionic liquids 379
low-temperature fluidity 8–10
nanofluid fuels 323–328
- w**
- wet mechano-chemical techniques 298–299
- y**
- yield stress 343–345, 348–350, 352
- ylide cyclopropanation process 170, 190
- z**
- ζ -potential measurement 306–308
- zinc carbenoid-mediated cyclopropanation 171–174
- ZSM-5 44, 87–90, 93, 260, 283



























