

Index

a

- A4 design for width printhead 489
- A51 stackable printhead module 488
- absolute calibration 1345
- absolute inline calibration 1345
- absorbed dose 1014, 1016
- accelerated sedimentation rate test 393
- accelerated stability measurement method 392
- accelerated stability tests 309–310
- acceleration voltage 978–981, 985, 986, 989, 1012, 1013, 1015–1025
- AccurioJet KM-1 504
 - fundamental requirements 1185
 - halftone screen pattern optimization
 - dark tone screen pattern 1194–1196
 - mid-tone screen pattern 1193–1194
 - ink formulation with wax oil gels 1191–1192
 - ink type selection 1187–1188
 - nozzle compensation 1196–1197
 - oil ink 1187
 - organogel selection 1190–1191
 - precise adjustment process 1197–1198
 - shading correction 1198
 - specifications 1186
 - structural illustration 1186
 - UV-curable ink 1186–1188
 - water-based ink 1187
- achievable resolution 86–87, 96, 1381
- acid and reactive dye inks 106
- acid-catalyzed direct esterification 139, 149
- acid dye inks 346, 848, 854, 863
- acid inkjet printing on polyamide, silk and wool textiles 854–355
- acid inks 848, 851, 855
- acids/pH puffer 855, 856
- acoustic crosstalk 477, 1160
- acoustic sensing, paint 809
- acrylamide monomers 161
- acrylamides 129, 161, 168, 209, 256
- acrylate/alkene and methacrylate/alkene monomers 167
- acrylate-based inks 314, 1370
- acrylate-based UV inkjet ink formulations 285
- acrylated polymer dispersions 334
- acrylated polyurethane dispersions (Ac-PUDs) 334
- acrylate monomers 128, 139–152, 155, 158, 159, 162–166, 168, 173, 182, 183, 213, 258, 284, 286, 311, 314, 316, 327, 328, 331, 951, 953, 958, 966, 1357
- acrylate oligomers 164, 168–173, 177–180, 328, 987
- acrylate radicals 139, 140, 152, 965
- acrylate/vinyl ether and methacrylate/vinyl ether monomers 165–167
- acrylic acid co-polymers (ASE) 348
- acrylic copolymers 855, 856
- acrylic resins 106, 455
- activation rate 890–891
- active directory protocols 1084

- actuation cycles, printhead 1162
- acylphosphine oxide 202, 203, 206–210, 212, 213, 215, 217–219, 227, 235, 237, 238, 242, 244–248, 253, 257
- additional technologies 525, 1188, 1209
- additive manufacturing (AM)
 - 1367–1368
 - advantages 1422
 - applications 1423–1425
 - definition 1353
 - filament 1353
 - industrial inkjet printheads 1417
 - inkjet printing of solder mask 1089
 - liquid photopolymer 1353
 - machine layout 1418
 - multi-process mode 1419–1420
 - production process 1421–1422
 - powder 1353
 - rapid prototyping and high-volume production 1418–1419
 - strategies in 1588–1591
 - 3D printing 1354
- additive processes 381, 384, 591, 885, 1257, 1289, 1427, 1428, 1432, 1433, 1435, 1438
- additive technology 388, 1221, 1267, 1403, 1427
- adhesion 96, 397
 - colorants/functional material 98, 104
 - to plastic substrates 144, 160, 170, 173
 - promoter 304
 - and rapid curing 68
 - and shrinkage 6
- Adobe Systems 1068, 1069
- adsorption dryers 881
- advanced manufacturing, Xaar
 - applications in 552–553
- Advanced Nano Products 1367
- advanced NIR-drying process
 - conventional IR-based process 1039–1041
 - on non-transparent substrates 1040
 - on (partial)-transparent substrates 1039
 - working principle 1039
- aerodynamic drag forces 19, 20
- aerodynamic solutions 38–39
- Aerosol Jet 1231–1233
 - CuNiMn strain gauge patterns 1241
 - printed CuNi patterns 1240
 - printed Cu structures 1240
 - system-in-foil 1248
 - 3D print 1248
- aerosol jet printing 895–897, 1221, 1247, 1248, 1250, 1251
- aerosol jetting 1376
- AF 32® eco thin glass 617
- Ag nanoparticles 100, 398, 1055, 1369
- airbrush (aerosol) technology 385
- air bubbles 9, 76, 395, 450–452, 455, 456, 507, 542, 543, 578, 591, 758, 761, 807–809, 1121, 1137, 1167, 1262
- air channel 508, 509
- air-cooled light sources 936, 937, 948
- air-cooled/water-cooled lamps 936
- aircraft interior parts 1316
- air-in faults 1121
- air-permeability 642, 649–651, 1559
- air plasma processes
 - chemical radicals 882–883
 - ozone production 883–885
 - positive and negative ions 882
 - volume chemistry 885
- air resistance 527, 562, 1559
- alcohol-containing monomers 333
- alignment, of printheads 1157
- aliphatic acrylates 140, 285
- alkali 254, 609, 617, 853
- alkylphenylglyoxylate 250
- allergenic effects 1642–1643
- ALTANA 1422, 1423
- amine co-initiator 212, 213, 225–230, 232, 234, 235, 238, 241, 247, 256
- aminoacrylates 328
- aminobenzoates 328
- α -amino ketones
 - derivatives 212
 - photoinitiators 209, 211–213, 215, 217, 225, 247
- ammonium sulfate 855

- ammonium tartate 855
 AMpolar i2 1423
 AMpolar machines 1419
 AMPolar technique 1423
 AMpolar-3D printer 1419
 analog metallization processes 384
 analog printing technologies 1203
 additional technologies 1209
 flexo printing 1207–1208
 screen printing 1205–1207
 analog printing vs. inkjet printing
 decision criteria technology
 1220–1222
 flexography printing resolution
 1223–1224
 inkjet printing resolution 1224
 right technology 1227–1228
 screen printing resolution 1222–1223
 analog processes 382, 383, 388, 634,
 1076, 1365
 analog sources, digitization of
 1078–1079
 analogue printing techniques 5
 angular light scattering intensity
 distributions 697
 aNIR dryer application 1048–1049
 anthraquinone 340, 341
 anti-foam agents 108, 304
 anti-wetting coatings 805
 antireflection (AR) coating 611, 615
 application of primers 861, 863
 applied inkjet 45
 aqueous acid textile ink formulation 116
 aqueous disperse dye textile ink
 formulation 117
 aqueous inks 21, 71, 100, 105, 107, 108,
 256, 333–334, 414, 426, 530, 544,
 546, 548–549, 643, 911, 1074, 1153,
 1165, 1210, 1356, 1675, 1676, 1689,
 1691
 aqueous pigment textile ink formulation
 116
 aqueous reactive textile ink formulation
 116
 AR Ink™ (Augmented Reality) 371
 arbitrary waveform generator (AWG)
 679
 arc lamps 9, 913, 915–919, 928, 930–931,
 935, 938, 939, 943, 945
 aromatic amine 224, 227, 238, 247, 1636
 aromatic hydroxy building blocks 170,
 172
 artisanal-industrial screen printing 1205
 aryl alkyl ketones 207
 arylsulfonium and iodonium salts 99
 AS 8® thin glass 619
 assessment factors (AF) 1628, 1629
 atmospheric oxygen 131, 777, 931
 atmospheric pressure glow discharge
 (APGD) 877
 atmospheric pressure plasma 874
 corona jet 878
 DBD-type 877–878
 discharge architecture 880
 piezoelectric direct discharge 880
 pulsed atmospheric arc 878–880
 Au/HAuCl₄ ink system 1242, 1243
 Austrian Ecolabel for printed products
 461
 automated non-contact cleaning system
 1106
 Automatic Color Calibration System
 1180
 automotive interior parts 1316
 auxiliaries/additives 364, 853, 855, 856
 axisymmetric modes 804
 azo/diazo class disperse dyes 340, 341
 azomethine 341
- b**
- B 270 Ultra-White glass 619
 ballast efficiency factor (BEF) 921
 ballast factor (BF) 921
 barcode verification 755
 Beer–Lambert law 779, 780
 bend mode printhead 513, 514
 1,2-benzisothiazolin-3-one 109
 benzoin ethers 208
 benzoin isopropyl ether 208
 benzophenone 209, 222

- bi-axially oriented polypropylene (BOPP) 257
 - bi-directional repeatability 1346
 - bidirectional scanning printer 1159
 - bifunctional α -hydroxy ketone 212
 - bifunctional photoinitiators 210, 226
 - binary charge deflection, in CIJ 468
 - binary vs. greyscale printing 476
 - binders 106
 - bio-polymeric thickener 853
 - bio-printing 13, 82
 - biochemically reactive inks 106
 - Biocidal Products Regulation 1642
 - biocides 109, 1642
 - biopolytronics 499
 - biotechnology 1674
 - bis(2,4,6-trimethylbenzoyl)-phenylphosphine oxide 230
 - bisacyl germanium and tetraacyl silane 249
 - bisacylphosphine oxide (BAPO) type photoinitiators 210, 212, 215–218, 235, 247
 - bismesitoyl-phosphane 255
 - bisphenol A (BPA) 146, 157, 170, 177, 1626, 1641–1642
 - bisphenol compounds 168
 - black density 634
 - blocked copolymeric dispersant 343
 - Blue Angel 460, 461
 - Boltzmann method 813
 - borosilicate glass 607, 610, 617
 - bottom-up structural electronics 1371, 1378–1379
 - boundary conditions 783, 1027, 1039, 1050, 1348, 1572, 1650–1654
 - bow waves 26
 - Braille codes 73
 - brick industry 359
 - brownish reactive disperses dye 351
 - Bruker Alpha FTIR 965
 - Bundesdruckerei GmbH (BDr) 1570
 - business asset 1699–1700
 - 1,4-butanedioic acid divinyl ester 162
 - 1,4-butanediol diacrylate 146, 162
 - 1,4-butanediol diglycidyl ether diacrylate 176
 - 1,4-butanediol dimethacrylate 157, 162
 - butylacrylate molecule 954
 - 2-[[[(butylamino)car-bonyl]oxy}ethyl acrylate 143, 144
 - 4-*tert*-butylcyclohexyl acrylate 140, 142
 - γ -butyrolactones 268
- C**
- CA4 571, 577, 578
 - Caber Apparatus 665
 - CAD program 1436
 - cadmium-based QDs 422
 - Cambridge Trimaster 665–668
 - camera calibration 758–760
 - capacitively coupled plasmas (CCP) 875
 - capillary and multipass rheometer 663
 - capillary number *versus* Weber number 52–54
 - capillary rheometer 663
 - carbazoyl glyoxylate esters 247
 - carbon-based nanoparticles 1412
 - carbon-centred propagating radicals 132, 775
 - carbon-centred secondary propagating radicals 131, 132
 - carbon-centred tertiary propagating radicals 131
 - carbon footprint 863, 1652, 1653, 1656, 1658, 1660, 1661, 1663, 1665
 - carbon nanotubes (CNTs) 102, 114, 1368
 - carbon products 529
 - carboxymethyl cellulose 649, 853
 - carboxymethyl starch 856
 - carboxymethyl tamarind 856
 - Carcinogenic, Mutagenic or Reprotoxic (CMR) category 1626
 - cathode fall 873
 - cationically polymerizable formulations 328
 - cationic inkjet formulations 258–260
 - cationic photoinitiators 5, 251, 259, 261, 280, 1633
 - cationic pigments 645

- cationic polymerization 99, 260, 269, 280, 325
- $C_D(Re)$ coefficient 22
- CE2 571, 577, 578
- central processing unit (CPU) 1083
- ceramic effect inks 362
- ceramic printing inks
 - auxiliaries 364–365
 - ceramic effect inks 362
 - ceramic production process 357
 - digital glues 363
 - fluids 364
 - further application 359
 - glaze coating 363–364
 - machine and printhead requirements 366
 - pigments 364
 - preparation 365–366
 - rheology 359–360
 - solvent-based ceramic inks 360–361
 - surface requirements 367
 - tile industry 358
 - water-based ceramic inks 361–362
- ceramic production process 357–358, 360–362, 367
- ceramic tile decoration 530, 535, 547, 549–551, 1547
- CF1 series inkjet printhead 579
- CF3/CF3R 579–580
- checkerboard pattern 1306, 1307
- Chemical Abstracts Service 1631
- chemical inventories 15, 317, 1630–1631
- chemical luminescence 872
- chemical radicals 879, 882–883
- Chevron actuator 540
- Chromera 458
- CIELAB color space 1072
- circuit elements 1365
- circular economy 460, 1649–1666
- circular value chain 1650–1654
- clamshell type shutter 925, 926
- classic letterpress printing 1204
- Classification, Labelling and Packaging (CLP) 1641
- Clean Water Act (CWA) 1640
- Clevios P VP CH 8000 ink formulation 412
- closed/encapsulated print cabinet/print unit 936
- CMYK + color printed IJ processing 1046
- CNC machines
 - MABI robots 1335
 - SINUMERIK 840D sl
 - G-code 1336
 - secondary encoder 1335–1338
 - system overview 1336
 - technical data 1338
- coating methods 731
- coating station inline 1549
- coding and marking applications 106, 551, 946
- coefficients of thermal expansion (CTE) 1233
- coffee stain effect 111, 410–412, 419, 1232
- cold atmospheric pressure plasmas
 - corona discharge 875–876
 - dielectric barrier discharge 876–877
- cold-end-coating (CEC) 1529
- cold plasma 874, 877, 895
- collision frequency 869, 872
- colorants/functional materials 98, 100, 104, 113
- color bars 764, 1163, 1548, 1549, 1588
- colorblind 986, 1071
- color density uniformity 757
- colored laser personalization 1570
- color gamuts 14, 113, 287, 293, 305–307, 435, 524, 547, 551, 687, 845, 1075, 1503, 1549–1551, 1553–1555, 1572, 1577, 1579, 1680, 1707
- ColorGATE
 - Color Correction Loop 1077
 - Fingerprint technology 1077
 - Retouch module 1077
 - Surface Director 1079
- ColorGrip 458
- color management

- color management (*contd.*)
 - challenges in digital tile printing 1078
 - evolution of 1070–1072
- color measurement 10, 758, 760, 1072, 1076–1078, 1534, 1553, 1572
- color model 1072
- color printing 305, 342, 486, 496, 579, 585, 595, 627, 750, 1042, 1126, 1277, 1278, 1284, 1285, 1305, 1569
- color profiles 358, 1073–1075, 1077–1079, 1553, 1554
- color receiver layer (CRL) 648
- color registration error 1126–1128, 1163
- color space 346, 358, 422, 1072, 1077, 1079, 1524–1526, 1553, 1554, 1572, 1578
- commercially available polymeric dispersants 103
- Commission Regulation (EC) No 2023/2006 838, 842, 1635
- communication of risks 15, 1641
- compensation
 - friction 1343
 - robot calibration 1344–1345
 - torque pre-control 1344
- compressed dried air (CDA) 881
- computational fluid dynamics (CFD) 23, 576, 808
- conduction 1029, 1037–1039
- conductive adhesive 1235, 1243, 1244
- conductive heat transfer 1029, 1030
- conductive inks, for inkjet printing
 - ink and printing system interaction 388–389
 - inks physical properties 389–392
 - stability 392–394
- conductive patterns, manufacturing processes of
 - analog metallization process 384
 - analog vs. digital processes 382, 383
 - digital printing process 384–386
 - ink requirements 386–387
 - substrates 387–388
- conformal printing 1377–1379
- constant carbonyl group 825
- constructive interference 700
- continuous inkjet (CIJ) 467–469, 672–673
 - advantages 468
 - dot placement 753–754
 - dot quality 753
 - machine-readable codes 754–755
 - message creation 754
- control algorithms of robot and printheads 1271
- control printhead performance 8
- conventional resist application systems 1258
- conventional security printing technologies 1569
- convection heat transfer 1029, 1038
- cooling system, UV lamp 923–924
- coplanar barrier discharge (CBD) 877
- copper–nickel inks 1239–1240
- Copprint 1367
- corona discharge 875–876
- corona jet 878
- corona onset voltage 878
- corrugated board for packaging 450
- Corrugated Grip (CorruGrip) technology 1510
- cosmetics packaging 1638
- cotton textiles 853–855, 862
- Couette flow 29, 36–38, 527, 528
- counter electrode (CE) 1249, 1250
- COVID-19, textile industry 848
- creeping flows 21, 27
- cross-flow filtration technique 347
- crosslinked polyethylene 326
- crosslinker (CL) 144, 155, 176, 1236, 1237
- cross talk, modes of 477
- cured ink, cross-sectional STEM image of 1192
- curing dose 940, 959
- curing/drying methods 731, 977, 1005
- customary inkjet technologies 1569
- customer-specific systems 1314–1316
- custom marketing 1586, 1591–1592
- Cuttlefish® 1434, 1436

- cyan, magenta, yellow and black (CMYK)
 305, 342, 343, 657, 860, 1278, 1312,
 1578
 cybersecurity 1084
 cyclic trimethylolpropane formal acrylate
 140, 142
 cycloaliphatic 140, 144, 152, 155,
 168–170, 172
- d**
- D 263® T eco thin glass 617–619
 damper 557, 558, 1681
 damp heat 398
 data capture 679, 743–745, 1081
 data compression 1084
 data encryption 1084
 data flow 12, 598–600, 1083
 data handling, in inkjet printing
 number of pixels processed per second
 1081
 preparation 1082
 printing speed 1081
 quality factor 1081
 resolutions 1081
 usage 1082–1083
 data loss prevention (DLP) 1084
 data manipulation 762, 763
 datapath 1157–1160, 1164
 data preparation 14, 1082, 1109, 1300,
 1304, 1305, 1433–1436, 1532–1534
 data security 1084
 dark tone screen pattern optimization
 1194–1196
 DBD-type APPJ 877–878
 D bulbs 775
 de-aerating agent 304
 1,10-decanedioic acid divinyl ester 162,
 163
 1,10-decanediol diacrylate 144
 decanoic acid vinyl ester 162, 163
 decap phenomenon 518
 decorative spot-coatings 73
 décor paper 14, 642, 998, 1172, 1174,
 1176, 1544–1552, 1554, 1559, 1560,
 1566, 1704, 1705, 1707, 1710
- décor printing 65, 113, 998, 1005,
 1076–1077, 1171–1184, 1707
 DecoType Compact 1524–1525, 1527,
 1540
 DecoType Inks 1527–1528
 DecoType Lab 1523–1524, 1536–1538,
 1540
 DecoType Performance 1524,
 1526–1527, 1540
 DecoType Select 1522–1523, 1533–1536,
 1539–1540
 deflected PIJ chamber 478
 defoamers 107, 108, 285, 983
 degrees of ethoxylation 144, 149, 177
 deinkability
 INGEDE Method 11 453
 method and evaluation 452–453
 Deinkability Scores 452–454, 458, 459
 deinked pulp (DIP) 452
 deinking of digital prints
 dry toner 454
 dye based inkjet inks 456–457
 effect of paper 458–459
 effect of polymers 457
 effect of primers 458
 inkjet inks and deinkability 455–456
 liquid toner 455
 pigment based inkjet inks 457
 deinking process 7, 450–452, 455–457,
 459
 Dekron's digital direct printing process
 1522
 Dekron's direct printing technology
 DecoType Compact 1524–1525
 DecoType Compact Line 1527
 DecoType Inks 1527–1528
 DecoType Lab 1523–1524
 DecoType Performance 1526–1527
 DecoType Select 1522–1523
 ink drying process
 DecoType Lab, Compact and
 Performance 1540
 DecoType Select 1539–1540
 UV curing 1539
 print data preparation 1532–1534

- Dekron's direct printing technology
(*contd.*)
- printing process
 - DecoType Lab, Compact and Performance 1536–1538
 - DecoType select 1534–1536
 - substrate preparation
 - glass bottles 1528–1530
 - plastic containers 1531–1532
- Delta E 1197, 1555
- demonstrator cube 1243, 1244
- density unevenness compensation (DUC) 758, 760–, 762–763
- density unevenness measurement (DUM) 758, 760–762, 766
- derived no-effect level (DNEL) 1628
- Derjaguin–Landau–Verwey–Overbeek (DLVO) theory 47, 103
- Design Software 1506–1507
- design switches 1705
- destructive interference 700
- detector spacing 703
- device-dependent color 10, 1071–1073
- dewpoint 881
- diamond-like carbon (DLC) 611, 886
- dichloroquinoxalines 848
- dichlorotriazines 848
- dicyclopentanyl acrylate 140, 143
- dicyclopentenylxyethyl acrylate 167
- dicyclopentenylxyethyl methacrylate 167
- dielectric barrier discharge (DBD) 776, 876–877, 917, 967, 974
- diethylene glycol divinyl ether 158, 159
- diethylene glycol monobutyl ether 104
- diethyl phthalate (DEP) 420, 670
- diethyl thioxanthenes 209
- diffractive optical element (DOE) 515
- diffused plasma mode 879
- diffusivity 661, 873
- difunctional acrylate monomers 139, 140, 144–146, 164, 166
- difunctional methacrylate monomers 155–157
- digital ceramics printing 1077–1078
- digital décor printing 1071–1184
- digital embellishments, Xaar applications in 551, 552
- digital front end (DFE) 14, 1506–1507, 1513
- digital glues 6, 363
- digital imaging 337, 340–342, 351, 353, 625, 635, 697
- digital inkjet printing 5, 928, 1695
- digitalization 633, 829, 1089, 1185, 1203, 1288, 1521
- digital lacquer embossing 11, 1183, 1184
- digital light processing (DLP) 1247
- digitally printed inks 383
- digitally printed packaging products 1074
- digital (“maskless”) technique 1372
- digital printed electronics 381, 382, 388, 399
- digital printing patent 1551, 1704–1710
- digital printing process 384, 696, 1299, 1706
- digital printing technologies 95, 1231
 - Aerosol Jet 1233
 - advantages 383
 - demonstrator cube 1243
 - DNA sensing 1249–1250
 - influence factors 1232
 - microelectronic devices and microsystems 1231
 - printed antennas on mold package 1243–1244
 - printed heater 1242
 - printed strain sensors on foil 1245–1247
 - printed temperature sensors 1244–1245
 - 3D-printed substrates 1247–1249
- digital structure IP 1708–1709
- digital textile printing 846, 1075
 - color control and business flexibility 1075–1076
 - color management challenges 1078

- (reactive) dye-based inks 102
- ink consumption 337
- digitization, of analog sources 1078–1079
- DIGITOUCH 1704, 1708
- Dimatix core technology 525
- dimensionless numbers 20, 50, 110, 394, 395
- 4,4'-bis(dimethylamino) benzophenone (Michler's ketone) 222
- 4-dimethylamino benzoic acid 228
- dimethyl benzil ketal 208, 209, 212, 255
- dimethyl benzyl ketal 210, 211
- dimethyl ethanolamine 227
- 2,6-dimethyl-*m*-dioxan-4-ol acetate 109
- diode-pumped solid-state lasers 714, 913
- dipropylene glycol diacrylate 133, 144, 146, 782, 783, 785
- direct current (DC) discharge 874
- direct 3D inkjet printing 1355–1358
- direct-to-fabric printing 855
- direct-to-garment (DTG) inkjet printing 106, 337, 1075
- direct-to-object printing 68, 71, 74, 551–552, 1319
- direct-to-shape (DTS) inkjet printing 7
 - Heidelberger Druckmaschinen AG
 - customer-specific systems 1314–1316
 - Omnifire 1000 1311–1314
 - shape printed objects 1317
 - industrial printing system 1300
 - handling system 1304–1305
 - printing process unit 1301–1304
 - print data provision 1305–1307
 - pinning module 1314
 - planning software 1315
 - three-dimensional objects 1300
 - workflow-architecture 1307–1311
- direct-to-shape printing 12, 14, 70, 74–81, 113, 279, 283, 292, 549, 551–552, 1299–1317, 1321, 1349, 1528
- DirectCure lamps 954, 956–958, 961, 963, 964
- direct UV-emitting laser diodes 913
- discharge poisoning 884
- discrete electric and photonic components 1288
- α -disilyloxy ketones 213–215
- Disperbyk 103
- dispersants 70, 103, 107, 117, 118, 126, 127, 180, 253, 285–289, 304, 343, 344, 349–351, 365, 374, 658, 661, 670
- disperse dye direct printing market 856
- disperse dye inkjet inks 337
- disperse dye inks 347, 349, 504, 855
- dissociation degree 871
- dissociation energy 199, 200, 770, 771, 774, 777, 869, 871
- disturbing defects 1553
- dithiocarbamate photoinitiators 200
- Diversified Nano Solutions Corporation (DNSC)
 - compatibility 372–373
 - ink security levels 375–376
 - print market history and opportunity 373–374
 - scope of activities 369
 - value-add 374–375
- divinyl ether compounds 286
- DI water 526, 614
- DMS+ 1335–1338, 1341–1343, 1346, 1347
- DNA sensing 1249–1250
- Domino 372, 1632–1635
- doped medium-pressure mercury lamps 202, 775–777, 793
- Doppler difference frequency 702, 703, 706
- dose density 773
- dot coalescence 1193, 1197
- dot pattern simulation, parameters for 1193
- dot placement 7, 74, 574, 723, 753, 754, 1196, 1197

- dot positioning accuracy 732
- dot quality 735, 748, 753, 755, 1618
- double-bond density 132–134, 137, 139, 149, 170, 173
- double-ended side-shooter architecture 540–542
- double strobe images 720, 721
- down-draw process 609
- drag force 19–25, 27, 28
- drag reduction factor 27
- drag-shielding effects 19
- drag-shielding factor 23, 24
- drift 72, 334, 870, 876, 1076, 1123, 1130, 1232, 1572, 1578
- drive-per-nozzle (DPN) technology 516–517
- drop ball viscometer 672
- drop bouncing 26
- drop formation 3, 5, 9, 12, 14, 19–22, 24, 28, 51, 285, 304, 360, 394–395, 399, 407–409, 412, 421, 474, 480, 481, 548, 657, 660, 665–667, 669, 673, 678, 679, 696, 718, 722–724, 726, 729, 743, 747, 801–807, 811–815, 1238, 1467, 1468, 1538, 1574–1577, 1599, 1600, 1605, 1679
- drop generation 50, 109–110, 475, 492, 1098, 1472, 1574
- drop latency and recoverability 47–48
- droplet landing position errors 1156
- droplet measurements
 - calibration 706–707
 - light scattering interferometry 698–700
 - measurement capabilities 707–713
 - particles in droplets 713
 - phase Doppler interferometry 700–706
 - review of optical methods 697–698
- drop mixture table 762, 763
- drop-on-demand (DoD) inks 673
 - automation 750–752
 - image quality assessment 747
 - injection systems 695
 - inkjet drop formation phase 19
 - inkjet ink requirements 344, 386
 - inkjet systems 51
 - ink–substrate assessment 748–750
 - printheads 125
 - printing 342
 - printer 46
 - single-color assessment 747–748
 - techniques 107
 - variation 719
 - workflow assessment 750
- drop placement accuracy 524, 574–575, 588, 594, 740, 754, 1473, 1598, 1613–1616
- drop substrate interaction 396–397
- drop volume, variation 564
- Dropwatcher microscope 409, 413
- drop-watcher module 1323
- drop watching 717–721, 724, 731, 746, 1323, 1599
- DryCure Au ink 1243
- dry rub resistance test 1557, 1558
- drying/steaming process 854
- dry toner 65, 66, 454, 455
- Dupont 199, 200, 382, 1367
- DuraFlex printhead
 - A3+ printhead 595–599
 - bonded firing chamber 597
 - chip surface 598
 - cross section 597
 - 1600 native dpi resolution 598
 - print quality 598
 - technical advancements 595
- DuraLink A4 bonded heater design 592–594
- dye-based inkjet inks 100, 456, 459
- dye diffusion thermal transfer (D2T2) 337, 1570
- dye sublimation inkjet inks
 - color considerations 345–347
 - ink, transfer media and substrate 342–345
 - major advantages of sublimation imaging 339–340
 - major development opportunities 351–353

- major engineering and process aspects 347–349
 - sublimation colorants 340–342
 - transfer vs. direct printing 349–351
 - dye-type inks 102
 - dynamic gradation control method 571
- e**
- EB-curing inks 6, 323
 - EB curing process 6, 983, 1012, 1025
 - EB Inkjet Pilot Line 993
 - ecolabelling 460
 - Eco Passport 114
 - ecological aspects, sustainability 15
 - ecological requirements for primers in textile industry 862–864
 - effects of gravity on drop motion 24–25
 - Efka 103
 - elastic collisions 869, 916
 - electrical (ground plane droop) induced cross talk 477
 - electrical consumption 1655
 - electrical LEM of a piezo actuator 476
 - electrically conductive metal-based inks 1374
 - electrical quasi-neutrality 871
 - electric field production method 874–875
 - electric permittivity 699
 - electrodeless discharge 875
 - electrohydrodynamic jet (EHDJET) 405, 425
 - electroless plating 385, 1232, 1247–1249
 - electroluminescent emitter (EL) 429
 - electroluminescent QD-LEDs 423
 - electromagnetic heat transfer 1031
 - electromagnetic spectrum 201, 202, 207, 216, 246, 771–772, 774, 777, 778, 909–910, 913, 916, 986, 987
 - electromagnetic wavelength spectrum 1030
 - electron beam (EB)
 - acceleration voltage 979–981
 - advantages of 1004–1005
 - chamber and surroundings layout 978
 - chemistry basics 979
 - compact emitters
 - sealed 989–990
 - vacuum pumping system 990
 - cooling water/air supply 999
 - crosslinking 985
 - curing 982–984
 - alcohol-containing monomers 333
 - aqueous inks 333–334
 - dose, accelerating voltage and cure 330–331
 - interstation drying/curing 329
 - mechanism of 324–326
 - nitrogen inertion 329
 - polyether-containing monomers 331–332
 - polyethers and alcohols 332–333
 - raw material selection 327–329
 - vs. UV curing 326–327
 - degradation/chain scission 985
 - dose 981
 - electrical power 999
 - industrial inkjet printing 1011–1026
 - interference radiators 1003
 - linear cathode 990–992
 - low-energy electron beam systems 989
 - nitrogen supply/ozone exhaust 999
 - ozone exhaust
 - exhaust air system over the roof 1001
 - in-house nitrogen production 1000–1001
 - liquid nitrogen supply 1000
 - ozone depletion unit 1001
 - printing industry 992
 - production line/printing press 999–1000
 - scanning beam systems 990
 - shielding 1001–1002
 - space and floor load 999
 - stray radiation sources 1003
 - substrates 985–986
 - throughput, dose rate 981, 982
 - UV 986–988

- electron beam (EB) (*contd.*)
 - working staff requirements 1002–1003
- electron beam melting (EBM) 1363, 1430
- electron beam processor 989, 993
- electron concentration 871, 874
- electron cyclotron resonance (ECR)
 - plasma 875
- electronegative plasmas 874
- electronic ballasts 921
- electron impact ionization 869, 876, 882, 883
- electron temperature 871, 873
- electron thermalization 871
- electron transport layer (ETL) 417, 421, 1218
- electropositive plasmas 874
- electrostatic inkjet printheads 1684
- electrostatic printing (ESJET) 425–427
 - high-resolution AMOLED device fabrication 427–429
 - increasing printed OLED pixel resolution 427
 - vs. inkjet printing 426
 - printhead 426
- electrosteric stabilization mechanism 103, 343
- elliptical reflector 923
- embellishments, inkjet 566
- EN 428, 1561
- encoder system
 - accuracy 1163
 - electrical issues 1164
 - frequency effects 1164
 - resolution 1163–1164
- endocrine disruption 1642
- energy consumption 9, 863, 914, 916, 917, 919, 944, 946, 949, 977, 1005, 1045, 1047, 1049, 1369, 1652, 1655, 1656, 1658, 1660, 1665, 1666
- energy-curable ink 323, 327, 328
- energy density 291, 294, 298, 515, 773, 923, 982
- energy-efficient single-cycle actuation modes 73
- ensemble light scattering methods 697
- environmental compliance 139, 181, 199, 524
- environmental protection 15, 361, 1640–1641
- Environmental Protection Agency (EPA) 232, 1630
- EOTMPTA 987
- epichlorohydrin 168
- epoxidized soybean oil acrylate 170
- epoxy acrylate oligomers 168–170
- epoxy-based adhesives 506
- EPSON S800 printheads 78, 81
- error diffusion schemes 1159
- erythritol acrylates 285
- ETH Zürich 1684
- ethoxylated bisphenol A diglycidyl ether diacrylates 177
- ethoxylated (3 EO) trimethylolpropane triacrylate 133, 136, 144, 148, 149
- ethoxylated (6 EO) trimethylolpropane triacrylate 148, 149
- ethoxylated trimethylolpropane triacrylate (TMPeoTA) 177, 256, 959
- ethyl acetate 104, 1640
- ethyl dimethylaminobenzoate (EDB) 248, 250
- ethylenediamine tetraacetic acid (EDTA) 109
- ethylene glycol (EG) 104, 105, 107, 108, 115, 157, 210, 386, 407, 1237–1239
- ethylene glycol butyl ether acetate 104
- ethylene glycol-substituted derivative 210
- ethylene/propylene glycol acrylates 285
- ethylene-vinyl acetates/polyvinylacetates 860
- ethyl lactate 104
- ethyl Michler's ketone 217, 246, 247
- (3-ethyloxetane-3-yl)methyl acrylate 140, 143

- Europe REACH Regulation (EC)
1907/2006 1640
- European Chemicals Agency (ECHA)
215, 1626, 1628, 1630
- European Declaration on Paper Recycling
460
- European Ecolabel for printed products
461
- European Paper Recycling Council
(EPRC) 452
- European Patent Office's Worldwide
Patent Statistical Database 1672
- European Printing Ink Association
(EUPIA) 229, 319, 438, 1631
- European Union (EU) 228, 317, 437,
440, 1630, 1635, 1639
- evaporation process 873, 1037
- excimer lamps 776–778, 793, 794, 913,
965–969, 972–974
- excimer UV lamps 917, 918
- excitation energy 869
- excited states
chemical luminescence 872
rotationally temperature 872
vibrationally temperature 872
- extensional rheometers 665–669
- extensive plank format options 1548
- external photoinitiator 954
- extrusion-based surface manufacturing
499
- eye-catching packaging 1521
- f**
- Facadeclick technology 1703, 1704
- failure mechanisms 6, 8, 179, 802–807
- feathering 845, 846
- feedback control systems 815
- feedforward control 809, 815, 816
- field crosstalk 477
- filament stretching 672
rheometer 662, 663
techniques 665
- film deposition 499, 874, 877, 883,
885–887
- film forming coatings 646–647
- filter radiometers 790–794, 796
- filtration mechanism 644
- FINAT 1658, 1660, 1661, 1663
- fine angle adjustment method 1197
- fine art paper 8, 634–636
- fine line printing 89
- Fingerprint technology 1077
- finite element analysis 479, 528, 1338
- flame processed 646
- flame-retardant materials 856, 861, 1362
- flash lamp systems 1053, 1054
- flash method 1600, 1604
- flash sintering 1369
- flat inkjet printing 1302
- flat printing 1204, 1205, 1299, 1302,
1304
- flexible hybrid electronics (FHE) 1061
- flexible packaging 299, 324, 633, 1005,
1048, 1049, 1132
- flexible solder resist 1258–1260
- flexible 3D structures 99
- Flexinity®, SCHOTT 621–622
- flexo applications 992
- flexographic inks 61, 455
- flexographic printing 11, 306, 318, 945,
1204, 1207, 1208, 1250
- flexography 384
- flexography-printing resolution
1223–1224
- flexo inks 328, 329, 959, 961, 992, 1117,
1228
- flexo printing 82, 323, 329, 330, 845,
992–994, 1148, 1207–1210, 1227,
1228, 1272, 1506
- flextensional transducer 1685
- flight analysis, drop in 722–723
- flight imaging, drop in 718–721
- Floating Wood Tiles 1171
- flotation deinking 450, 451, 455
- fluidic crosstalk 72, 477
- fluid recirculation 523, 525–526
- foam formation 108
- focused plasma mode 879
- Food and Drug Administration (FDA)
229, 436–437, 1637

- food contact materials (FCM) 114, 317, 436–437, 446, 841, 1635
 - Food Contact Substance Notification (FCN) 1637
 - food dye inks 106
 - food packaging
 - China 1637
 - Europe 1635–1637
 - and food contact materials (FCM) regulatory regimes 436
 - Nestlé 1638
 - photoinitiators and 1004–1005
 - United States of America 1637
 - force sensitive resistors (FSR-sensors) 1213
 - forensic equality 1577
 - Formica® 1543
 - forming gas 885
 - formulation viscosity and ink jettability 134–137
 - FOTURAN® 620
 - FOTURAN® II, 618, 620
 - four-color printing process 305
 - fourdriniermachines 643
 - Fourier-Transform InfraRed (FTIR) spectroscopy 825, 834
 - F-PLC 1341
 - framework regulation (EC) No 1935/2004 1635
 - Fraunhofer diffraction method 697
 - free path 869, 870, 873, 887, 1275
 - free radical polymerization 6, 258, 260, 280, 325, 328, 911, 982, 983, 986
 - friction compensation 1343
 - Fromm's parameter 407
 - Fujifilm Dimatix's Samba G3L type of printheads 348, 1373
 - full width at half maximum (FWHM) 777, 778
 - fully printed PCBs 1371
 - functional foil bonding (FBB) 1377
 - functional inks, for inkjet printing 1051
 - functional materials, ink formulations and processes 406
 - functional nanofillers 128
 - functional printing 59, 69, 87, 112, 113, 127, 399, 1098, 1209–1213, 1221, 1223, 1224, 1231–1251, 1613
- g**
- Galvano and etch resist 1267
 - gaseous breakdown 874
 - gas ionization 868–869
 - gellants 1190, 1191
 - General Exclusion Order 1702
 - generation 1 Memjet MEMS/CMOS chip 587
 - glass 607
 - AF 32® eco thin 617
 - AS 87® eco thin 619
 - borosilicate 607
 - ceramic 619–620
 - characteristics 607–608
 - cleaning method 613
 - D 263® T eco thin 617–619
 - enhanced glass strength 611–612
 - geometrical properties 611
 - lead 608
 - manufacturing process 608
 - materials 616
 - MEMpax® thin 617
 - optical 616–617
 - photosensitive 620
 - physical and chemical properties 609–610
 - soda-lime 607
 - surface properties 612
 - surface quality 612–613
 - technical properties 614
 - touchscreen application 615
 - glass B 270® 619
 - glass industry 359
 - glass printing applications 551
 - glaze coating 362–364
 - global harmonization system (GHS) 181
 - Globally Harmonized System of Classification and Labelling of Chemicals (GHS) 1641
 - Global Organic Textile Standard (GOTS) 114

- gloss, of an image 1198
 glue, inkjet 566
 glycerol 108, 333
 gold ink 1237–1239
 good manufacturing practice (GMP)
 318, 436, 437, 838, 841, 912, 951,
 952, 1635
 graphene 102, 114, 1368, 1377
 graphical processing unit (GPU) 1083
 graphic arts 59, 102, 373, 389, 631–634,
 1069, 1077, 1553, 1554
 graphic industry 1203
 graphic paper recycling system 455
 graphic paper 449–451, 455, 456
 gravure printing 14, 98, 112, 357, 384,
 845, 992, 1011, 1172, 1174, 1205,
 1207, 1209, 1221, 1545–1547, 1551,
 1565, 1705, 1707
 gray-level control technology 571
 greyscale printing 470, 474–476
 guar gum 853, 855
 Gurley seconds 1560
- h**
- HALCON software 1285
 HALs Tinuin 770, 352
 Hamamatsu Photonics' EB-ENGINE
 advantages of ultra-thin foil window
 1024, 1025
 features and specifications 1022–1023
 maintenance 1025
 structure 1023–1024
 hard coatings 611, 616
 hard segments 172
 hardware RIPs 1068
 Hazard Communication Standard (HCS)
 1641
 hazardous materials 435, 740, 1632
 head personality card (HPC) 1320,
 1322
 head resolution 1549, 1710
 heat conduction principle 1029–1030
 heat convection principle 1029
 heated printing 1706
 Heidelberg Druckmaschinen AG
 customer-specific systems for
 1314–1316
 Omnifire 1000 1311
 shape printed objects 1316–1317
 Helmholtz frequency 472, 473, 479
 hetero-phase ink 100
 Hewlett Packard's Indigo and Flint's
 Xeikon processes 326
 hexaaryl-biimidazoles 246
 hexamethylbisimidazol (HABI) derivative
 220
 1,6-hexanedioic acid divinyl ester
 162–164
 1,6-hexanediol diacrylate 144, 146, 164
 hexanoic acid vinyl ester 162, 163
 hierarchical groups, of ink properties
 388–393
 High Density Nozzle Architecture
 (HDNA) platform
 dual drop weight implementation
 492–493
 inertial pumps in 493–494
 high-distance printing 74–81
 high energy EB sources 1011, 1017
 high-energy radiation sources
 1038–1039
 higher aspect ratio 65, 510
 high-frequency rheology 663, 664, 675,
 676, 690
 high-frequency rheometers 663–665
 high-intensity reflector system 928, 929
 High Laydown Technology 73, 544–545,
 547, 551–553
 highly accurate metal nozzle plate
 515–516
 highly conductive PEDOT 412–414
 high-pressure cleaning systems 1456
 high-pressure plasmas 873–874
 high-resolution AMOLED device
 fabrication 427–429
 high-speed data flow electronics 599,
 600
 high-speed sintering (HSS) 12, 81,
 1358–1362
 high-standoff printing 527–529

- high viscoelasticity 669
- high-viscosity fluids 547, 687, 688
- high-voltage power cable 989, 990
- high voltage power supply 989, 1014, 1018, 1024, 1025
- hole transport layer (HTL) 417, 1218
- horizontal jetting 23, 25, 293
- hot-end-coating (HEC) 1529
- hot-melt ink formulation 99, 115
- hot-melt inks 98, 99, 102, 111, 115, 249
- hot-melt transfer media 345
- hot plate method 410, 414, 1038, 1562, 1564
- HP Binding Agent 496, 1392, 1394–1397
- HP inkjet, printheads
 - for scanning multi-pass printing 485–486
 - pagewide printing 486–488
- HP metal jet process
 - cure the bed 1396
 - decaking 1396
 - evaporation 1396
 - finishing 1397
 - print agent 1396
 - retract the bed, print next layer 1396
 - sintering 1396–1397
 - spread powder 1396
- HP metal jet technology 1392, 1394, 1397, 1400
- HP Multi Jet Fusion 1391–1393, 1398, 1400
- HP PageWide XL printer 489
 - PWA calibration 491
 - PWA printhead design 490
 - PWA printhead servicing 490–491
- HP's commercial and industrial printing solutions 1392
- HP's inkjet presses, industrial corrugated packaging
 - bonding agent 1504
 - C500 direct
 - digital front end (DFE) and design software 1506–1507
 - 1.3M direct to corrugate press 1506
 - finishing solutions 1513
 - ink attributes 1511–1512
 - media handling and drying 1510–1511
 - printheads, printbars and writing system 1507–1510
- HP's T1190S
 - DFE, multi-lane architecture 1513–1514
 - finishing solutions 1518
 - ink attributes 1517–1518
 - media handling and drying 1516–1517
 - printheads, printbars and writing system 1514–1516
 - 110" simplex pre-print liner press 1514
 - packaging printing 1503
- HP's Open Platform approach 1393
- HP's Virtual Belt 1510
- HP's Webpress printers 1674
- HP T300 Color Inkjet Web Press 1081–1083
- HP thermal inkjet 1391, 1392, 1394–1396, 1400
- humectants 105, 107, 108, 118, 180, 181, 344, 348, 374, 438, 442, 854, 864, 1028, 1038, 1039, 1550
- hybrid additive manufacturing process 1294, 1295
- Hybrid Side-shooter actuator architecture 541
- hybrid 3D printing 1378
- hybrid UV inks 282
- hydrophilic polyacrylic acid blocked synthetic copolymer 343
- hydrophilic poly(ethylene) glycol substituent 253
- hydrophilic styrene-acrylic synthetic polymeric acid/salt 343
- hydrophobically modified acrylic acid co-polymers (HASE) 348
- hydrophobically modified polyurethanes (HEUR) 348
- hydrophobic recovery 876, 893–895
- 4-hydroxybutyl acrylate 143, 172, 176

- 1-hydroxy-cyclohexyl-phenyl-ketone
209
- 2-hydroxyethyl acrylate 172, 176
- hydroxyethylcaprolactone acrylate 143,
172
- hydroxyethyl cellulose 853, 855
- 2-hydroxyethyl methacrylate 154, 174,
176
- para*-hydroxyethoxy substituted derivative
209
- α -hydroxy ketone 99, 203, 208–214, 217,
219, 223, 230, 234, 241–244,
246–248, 253, 255
- 2-hydroxy-2-methyl propiophenone 956
- 2-hydroxy-2-methyl-1-propiophenone
209
- 2-hydroxypropyl acrylate 143, 172, 176
- 2-hydroxypropyl methacrylate 154, 174
- hydroxypropyl tamarind 856
- hygiene papers 450
- Hymmen digital décor printing
digital printing 1175–1176
laminare flooring industry 1171–1175
- Hymmen Digital Lacquer Embossing
1183
- i**
- ICBA (indene-C₆₀-Bisadduct) 422
- ICC color profiles 1073, 1553, 1554
- ideal viscoelastic ink 682, 683
- identity, credential and access
management (ICAM) model
1084
- idle test 395, 396
- IGBT switching technology 1053
- IJJ, machine integration
colour management and workflow
1143–1144
customer requirements 1111–1113
economics 1113–1114
ink choice 1117–1120
Mark Andy case 1147–1149
print quality issues
ink and media interaction
1132–1141
sideways movement 1126–1127
speed variation and media stretch
1127–1132
print reliability affect 1120–1125
project process flow 1114–1116
site survey 1116–1117
support expectations 1146–1147
system safety issues 1144–1145
3D issues affecting printhead life
1141, 1142
- IJ inks, thermal drying and curing
mechanisms 1039
- illumination by laser induced
fluorescence (iLIF) 814
- image fading 634, 635
- image quality assessment
continuous inkjet 752–755
drop on demand 747–752
- image quality, automation 750, 752
- ImagineX Technology platform
aqueous ink capability 548–549
higher-speed printing 549
higher-temperature printing 549
high-resolution printing 549
- Imaging IP 1705–1706
- impedance matching 875
- impedance spectroscopy 812
- Inca Digital Printers 1151
- incident light intensity 205, 697
- independent channel drive 504, 508, 509
- inductively coupled plasmas (ICP) 875
- industrial inkjet printing 5
electron beam source 1014–1015
handling system 1304–1305
high penetrability independent of
1013
inert gas 1016
operation and maintenance 1017
print data provision 1305–1307
printing process unit 1301–1304
product quality control 1016
radiation shielding 1015–1016
residue migration 1013
room temperature process 1014
solvent-free 1014

- industrial inkjet printing (*contd.*)
 - ULEB 1017
 - use of 1012
 - vs. EB and UV (lamp) curing, and heat (thermal) drying 1012–1014
- industrial production system 1669
- inelastic electronic collisions 869
- inert gas 318, 916, 920, 1016, 1024
- infrared (IR)-drying/processing 1027
- INGEDE Method 11, 452, 453, 457, 461
- Inhibitors, UV inkjet inks 127
- in-house nitrogen production 1000–1001
- ink additives 107, 110, 285, 837
- ink and media interaction
 - bleeding 1139
 - causes 1140, 1141
 - inkjet primers 1134
 - marks and blotches 1139
 - material surface texture 1136
 - pin holes 1137–1138
 - pretreatments 1134
 - satellites 1139–1141
 - white lines 1138–1139
- ink and substrate interaction, wetting 389, 396
- ink channel 503–511, 517, 518, 537, 541–544, 557, 558, 587, 596, 635, 678, 757, 758, 801, 804, 807–809, 812, 815, 816
- ink compounds and ink formulations 284–288
- INKcrypt® AR Ink™ 371
- INKcrypt® 6, 377
- INKcrypt® DNA 370, 377
- ink delivery system, requirements of 1152
- ink development framework 6, 442–443
- ink factors
 - capillary number versus Weber number 52–54
 - drop latency and recoverability 47–48
 - non-Newtonian inks 51–52
 - Z Number 49–51
- ink flow behavior 659–660
- Ink Formulation Guidance 438–439
- ink formulations and processes
 - ink solvent and solid composition 406–408
 - optimized drying and curing 410–411
 - printhead, optimized jetting parameters of 408–409
 - substrate properties and pretreatment 409–410
- ink formulator's 388, 435, 438, 440–445, 659, 691, 1637, 1641, 1642
- ink–ink interactions 731
- inkjet analysis, equipment standards 717
- inkjet droplet formation
 - degassing 1154, 1155
 - filtration problems 1154
 - pressure regulation 1153, 1154
 - printhead channel sizes 1153
 - temperature regulation 1154
- inkjet drops 3, 5, 19–25, 548, 628, 696, 724, 948, 1145, 1598–1604, 1608–1610, 1618
- inkjet hybrid printing platform 896–897
- inkjet inks 5–7
 - additives 670–672
 - continuous inkjet (CIJ) 672–673
 - and deinkability 455
 - drop-on-demand (DoD) inks 673–677
 - extensional rheometers 665
 - fluid response in printhead channel 677–679
 - formulation 118
 - high-frequency rheometers 663–665
 - jetting of high-viscosity inkjet inks 687–691
 - steady shear rheometers 663
 - step strain analyses to waveform features 684–687
 - temperature influence 683–684
 - TriPAV step strain printhead mode 679–682
- inkjet manufacturer 113, 499, 627, 1632
- inkjet patent diversity and directions
 - application diversity 1689–1692

- aspects of 1692–1694
- timescales and predictive aspects 1692–1694
- inkjet-printed heater structure 1242
- inkjet-printed microlens arrays (MLAs) 1219
- inkjet-printed nano silver ink 1237
- inkjet-printed OPV devices 421–422
- inkjet printed PCBs
 - maintenance 1103–1105
 - material compatibility 1099
 - material selection 1098
 - print process 1101–1103
 - printhead selection 1098–1099
 - waveform development 1099–1101
- inkjet-printed silver ink 1240, 1241
- inkjet-printed silver line 1233, 1234
- inkjet-printed silver pad 1235
- inkjet-printed silver tracks 1234, 1245
- inkjet-printed solder resist
 - advantages 1257
 - flexible solder resist 1258–1260
 - rigid soldermask 1260–1261
- inkjet-printed strain sensor 1246
- inkjet printed structural electronics
 - bottom-up 1378–1379
 - hybrid integration 1379–1381
 - resolution 1381
 - top-down 1379
- inkjet printers 1151
 - cleaning, serviceability and reliability 1165–1166
 - datapath 1158–1160
 - encoder system 1162–1164
 - full width multi-pass 1152
 - history of 635
 - miscellaneous observations 1166–1167
 - motion systems 1155–1157
 - printheads 1160–1162
 - scanning 1152
 - single pass printing 1152
 - system architectures 1151
 - system logging 1157
 - system software 1157
- inkjet printheads 1597
 - designs 657
 - manufacturing companies 1598
 - technology 7
 - zoo 1684–1688
- inkjet printing
 - adhesion 96
 - advantages 95
 - aerodynamic solutions 38–39
 - aerosol jetting 1376
 - applications 499
 - basics in a nutshell 1372
 - capabilities and limitations 69–71
 - conductive inks 97
 - continuous 467–469
 - curing and sintering 1374–1375
 - dispensing 1375
 - drag force 21–24
 - effects of gravity on drop motion 24–25
 - equipment 992, 993
 - fluid dynamic phenomena 96
 - formulations 114–118
 - general parameters and considerations 96
 - inkjet ink composition and ink types 98–111
 - inkjet inks and their applications 112–114
 - inkjet triumvirate 96
 - ink–substrate interaction 111–112
 - jetting performance 109
 - limitation for 425
 - moving drops 25–26
 - vs. other printing technologies 59–69
 - piezoelectric 469–480
 - processing 1372–1373
 - research and development projects 405
 - resolution 1224
 - Reynolds number 20–21
 - surface pre-treatments 1373
 - systems 739
 - on textiles

- inkjet printing (*contd.*)
 - application methods of primers 861–862
 - basics for 846–848
 - ecological requirements for primers 862–864
 - inkjet inks and dye–textile interactions 848–852
 - pretreatment/priming for digital 852–861
 - 3D printing 494–495
 - thermal inkjet 480–483
 - unstable flows 30
 - UV-curable inks 97
 - vortices 30
 - wakes 26
 - wettability 96
 - wood-graining effect 30–38
- inkjet-related standards
 - droplet volume 1609–1611
 - drop placement accuracy 1613–1616
 - drop speed
 - definition 1604
 - errors and uncertainties in 1607–1609
 - graph 1605
 - in-flight imaging of jetted drops 1603
 - inkjet drops 1599–1602
 - inkjet printing equipment 1597–1599
 - jetted drop direction 1611–1613
 - print quality assessment 1616–1617
 - printed electronics 1617–1620
- inkjet + robot 12, 1335, 1349
- inkjet system development 7, 523–525
- inkjet system solutions 3, 4
- inkjet technology 3, 4, 12, 39, 72, 107, 113, 139, 175, 181, 182, 220, 252, 268, 362, 435, 503–504, 511, 516, 519, 535, 548, 585–602, 648, 657, 757, 758, 766, 801, 802, 808, 1079, 1091, 1109, 1143, 1188, 1203, 1255, 1266, 1353, 1354, 1400, 1427, 1464, 1476, 1480, 1506, 1518, 1569, 1570, 1574, 1577, 1579–1581, 1613, 1671–1696
- inkjet throw distance graphs 22
- inkjetting, for surface deposition applications 498
- ink jetting optimization steps 395
- inkjet topography 1570
- inkjet triumvirate 96
- ink latency 7, 110
- ink-on failure 1123, 1124
- ink-on faults 1121
- ink-on problem 1123
- ink physical fingerprint 670
- ink polymerization 834, 836, 840, 948
- ink production 288–289, 300, 311, 318, 347, 435, 1633
- ink properties
 - other properties 662
 - surface tension 660–661
 - viscoelasticity 661–662
- ink recirculation
 - arrangement in Xaar 1003 printhead 543
 - technology 517–519
- ink security levels 6, 375–376
- ink shrinkage 314, 315
- inks jetting performance 45
- ink solvent and solid composition 406–408
- ink–substrate assessment 748–750
- ink–substrate interaction 111–112, 284, 644, 748
- ink supply system requirement 12, 111, 284, 304, 311, 312, 386, 542, 761, 1153, 1155, 1176, 1181, 1182, 1315, 1320, 1322, 1326, 1329, 1331, 1332, 1523, 1526
- ink system design 1152
- ink types 5, 78, 79, 98–109, 114, 279–282, 285, 375, 520, 560–561, 567, 633, 636, 827, 848–850, 857, 1028, 1083, 1187–1188, 1373, 1374, 1597
- ink viscosity and jettability 71–74
- INKplant approach 1295
- InkTec 1367
- in-mold electronics (IME)/injection molded structural electronics (IMSE) 1377

- Innosec Fusion® 1570
- inorganic pigments 102, 106, 118, 287, 357, 358, 360, 364, 649, 857, 858
- intaglio printing 1205
- integrated air-cooling 928, 930
- integration testing 739–741
- intellectual property (IP) 373, 525, 1289, 1548, 1551–1552, 1671, 1674, 1699, 1702, 1704
- intense pulsed light (IPL) 1369, 1375
- intense pulsed light sintering 1369
- intercolor bleed 313, 329, 334, 734, 748
- interference radiators 1003
- inter-head banding 1198
- interior decoration 235, 279, 290, 291, 293–294
- International Organisation for Standardisation (ISO) 1639
- internal photoinitiator 9, 954–957, 964
- Internet of things (IoT) 1203, 1272, 1376
- intra-head handing 1198
- Intrinsiq 1240, 1367
- Inventory of Effective Food Contact Substance Notifications 1637
- inverse kinematics 1344, 1345
- inverse of the Ohnesorge number 50
- ion etching 873
- ionic stabilizing agents 103
- ionization cascade 869, 876
- ionization degree 871
- ionization energy 868–871, 882, 916
- ionizing collision 868, 870
- IPC-SM-840 1095
- IR-dryer application
 - in continuous color IJ press on substrates 1042–1043
 - in continuous IJ color press 1045
 - in continuous multipass color IJ press 1047–1048
 - in high-speed continuous IJ press on wide format packaging substrates 1043–1045
 - in sheet fed-based IJ press on corrugated boards 1045–1047
- iron halide dopants 775
- irradiance 9, 211, 284, 291, 326, 699, 700, 771–774, 778, 779, 788, 790, 791, 793–797, 916, 917, 922, 923, 932, 934, 936, 937, 939–943, 947
- isobornyl acrylate 140, 142, 285
- isolated channel structure (ICS) 558, 560
- isopropylidene glycerol acrylate 183
- isopropylthioxanthone (ITX) 209, 217, 248, 256, 264, 298, 323
- isotropic conductive adhesive (ICA) 1235
- iterative learning control (ILC) 816
- j**
- jettability wider 407, 555–568, 666
- jettable and reliable Polymer Ink 1, 690
- jettable and unreliable Polymer Ink 2, 691
- jetted drop direction 1598, 1602, 1611–1613, 1618
- jetting capability of high viscosity 580–581
- jetting defects
 - frequency sweeping 728, 729
 - latency/decap 726
 - missing jets/sustainability 727–728
 - satellites/mist 724
 - waveform sweep 728–730
 - wetting 724–726
- jetting of high-viscosity inkjet inks 687–691
- jetting performance 8, 45–54, 69, 82, 109–111, 135, 299, 311, 312, 348, 395, 409, 511, 517, 560, 657, 672, 673, 684, 727, 731, 802, 1095, 1101, 1320, 1323, 1324, 1328, 1467, 1468, 1597, 1675
- jetting requirements
 - drop and jetting stability 395–396
 - printhead and drop formation 394–395
- jetting simulation technology 575–576
- jetting stability 54, 395–396, 508, 520, 541, 579, 661, 761, 809, 1167
- jetting straightness 80, 81, 757, 758, 1098, 1160
- JETx inkjet production equipment 1367

- JetXpert 718, 719, 721–723
 - J8 polyjet printing system 1432
 - JUPITER digital printing line
 - laminate flooring industry 1176
 - single pass printing
 - color balancing across the print bar 1179–1180
 - digital structuring/case study DLE 1182–1184
 - ink temperature control 1181–1182
 - material transport and encoder 1177–1179
 - printheads aligning 1177
 - just-in-time manufacturing 1548
- k**
- Kao Collins and INX Digital 995
 - 3-ketocoumarins 247, 248
 - key performance indicators (KPIs) 1284
 - kINPen 878
 - KM-1 inkjet printer 459
 - KM1024i head 504, 509, 510
 - Konica Minolta inkjet 1111
 - applications 511
 - bend mode printhead 513
 - drive-per-nozzle (DPN) technology 516–517
 - high durability 510–511
 - history of 503–504
 - ink recirculation technology 517–519
 - unique structures 504–510
 - Konica Minolta's KM 800 printhead 76
 - Korean Eco-label Standard EL101 2012 461
 - Krones' digital decoration technology 1521
- l**
- Labcyte 1686, 1687
 - Labelfire 340 6, 303
 - abrasion resistance 315–316
 - accelerated stability tests 309–310
 - color 304–306
 - failing mechanism 310–313
 - flexibility 315
 - industry standards 319
 - ink development 303
 - inks for indirect food contact 317–318
 - ink shrinkage 314
 - physical properties 306–309
 - regional markets 317
 - substrate adhesion 313
 - varnish 316
 - white 306
 - Labelfire 340, specific UV curable inkjet ink sets 303
 - label printing 6, 105, 291–293, 299, 303–319, 544, 551, 585, 1552
 - laminate flooring 1545
 - extern analog printed decorpaper vs intern digital printed decorpaper process 1174
 - flooring industry 1172, 1174
 - manufactured 1172
 - requirements 1176
 - rotogravure printing machines 1172, 1174
 - laminates
 - Delta E 1555
 - digital printing in
 - design freedom 1547
 - inkjet presses and heads 1548
 - intellectual property and trade secrets 1551
 - production 1548
 - production process 1551
 - substrate and primers 1550
 - water-based inkjet inks 1549
 - gravure and digital printing cost per volume crossover point 1565–1566
 - image quality 1552–1553
 - laminate industry 1543–1545
 - lightfastness 1558–1559
 - metamerism 1555–1557
 - primer application method 1557
 - primer binding and powdering effects 1557–1558
 - production process
 - cross-cut test 1560–1561

- EN438–water resistance trial–boiling water test 1561–1563
- EN438–water resistance trial–vapor test 1563–1565
- Gurley test 1559–1560
- melamine resin bath 1560
- milling, chipping, sawing 1565
- tonal density variation or banding 1555
- traditional production process 1545–1547
- lamp power 924, 925, 927, 940, 958, 959, 961, 962, 1145
- Landa Nanography 629, 631
- laser beam intersection angle 706
- laser direct structuring (LDS) 381, 385, 1378
- laser–Doppler interferometry 810, 816
- laser engraving 1272, 1283, 1569, 1570
- laser sintering 11, 386, 495, 622, 1232, 1236, 1239, 1251, 1358, 1360–1362, 1375
- latency 7, 47–48, 54, 110, 179, 181, 282, 395, 545–546, 549, 553, 717, 726, 732, 1118, 1130, 1159
- latex inks 106, 114, 1691
- lauryl acrylate 133, 140, 162
- lauryl methacrylate 162
- layer-by-layer printing approach 1405
- L2C holographic label program 1702
- lead glass 608
- legend printing 11, 1091, 1256–1259
- lens-arrays 1219
- letterpress printing 1204
- Lewis acid–catalyzed transesterification 139, 152
- Lewis acid–or Lewis base–catalysed addition reaction 172
- life cycle assessment (LCA) 1649–1650
- lift laser-induced forward transfer (LIFT) 385
- light emitting diodes (LEDs) 918, 919
 - demonstrator cube 1244
 - radiation sources 778–779
- lightfastness 304, 305, 309, 352, 457, 1558–1559
- light scatter detection angle 697
- light scattering interferometry 697–700, 713
- light sensitivity 758, 824
- light shielding 920, 924
- lightweight directory access protocol (LDAP) 1084
- lignins 343
- limit of zero Mach number 29
- linear cathode 989–992
- linear encoders 1164
- line/edge quality 732, 734, 1617
- linseed oil 169
- Linx CIJ inkjet printer 673
- liquid crystal polymer (LCP) 1233, 1237
- liquid inks 99, 280, 288, 825, 897, 932, 933, 1280, 1597, 1642
- liquid nitrogen supply 1000
- liquid phase sintering 1360
- liquid toner 60, 62–66, 452, 455
- liquid vehicles 98, 100, 104–107, 111, 113
- lithography-based ceramic manufacturing (LCM) 384, 1295
- locust-bean 853, 855, 856
- longevity test 395
- Lorentz–Mie theory 700, 703–705
- Lot-Size One technique laminate manufacturers 1175
- Lotus effect 613
- low density polyethylene (LDPE) 894
- lowest observable adverse effect level (LOAEL) 1627–1628
- low-energy electron beam systems 985, 989, 990
- low frequency (LF) discharge 875
- low-migrating acylphosphine oxide photoinitiators 237
- low migration food packaging 206, 228–245
- low-migration inkjet inks 294–300, 837
- low migration series 952
- low molecular type gels 1190

- low molecular weight oxidized materials 876
- low-pressure plasma 874, 875
- low temperature plasma 886, 887
- low-viscous UV inkjet inks 284
- low volume exemptions 1630

- m**
- MABI robots 12, 1335, 1337, 1340, 1347
- Mach number 29
- machine integration 4, 10, 11, 1111–1149, 1319
- machine-readable codes 452, 754–755
- machine vision algorithms 721, 733
- magnetic ballasts 921
- magnetic data storage 695
- malfunctioning nozzle
 - compensation 765–766
 - detection 763–765
- Marangoni flow 410, 661
- mass customization 298, 348, 494, 499
- mass production requirements, of
 - electronic devices 386, 399
- material footprint 1665
- MAX Linear Rail MLR-2000 1340–1341
- MAX Machining table MMT-250 1338–1340
- mean time to failure (MTTF) 835
- mechanical crosstalk 477
- Mechanical Memjet (MMJ) Single jet diagram 602
- Mechanical MEMS printhead design
 - directions 601–602
- mechanical vibration 1156, 1157
- Media Device Synchronization 1074
- medical devices 414, 695, 1012, 1424, 1626, 1638
- medium-pressure mercury lamps 199, 200, 202, 203, 774–779, 783, 789, 790, 792, 793, 954, 969
- melamine-impregnated paper 1548
- Memjet bonded printhead nozzle cross section 593
- Memjet page wide thermal inkjet printing technology 585
- DuraFlex A3/A4 bonded heater design 595–599
- DuraLink A4 bonded heater design 592–594
- fundamental concept 588
- low-cost printhead manufacturing 586–588
- printhead architecture 588, 590
- printhead design 601
- system approach 599
 - high-speed data path IC design 600–601
- mechanical hardware components 599
- modular ecosystem components 599–600
- Versapass A4 suspended heater design 590–592
- Memjet's DuraLink thermal inkjet printhead 76
- Memjet VersaPass page wide printhead 589
- Memjet Waterfall Printing Technology® 585
- MEMpax® thin glass 617
- meniscus pressure 544, 557, 725, 1319, 1322, 1325–1331, 1577, 1578, 1683
- message creation 754
- metal injection molding (MIM) metal powders 1392
- metal-oxide-semiconductor field-effect transistor (MOSFET) 1214
- metallization technologies, in electronics production
 - analog vs. digital processes 382–384
 - ink requirements 386
- metals, choice of 398
- metals, spectral measurements of 1033
- metamerism 1550, 1555–1557, 1710
- metastable excitation 870, 872
- methacrylate monomers 149–161, 165, 174
- methacrylate oligomers 173–174, 177
- methacrylate radicals 152
- 2-(methacryloyloxy)ethyl isocyanate 174

- methine 341
- 2-methoxycarbonyl substituted
 - benzophenone 223
- methoxy substituted keto coumarin 248
- methyl diethanolamine 227
- methyl ethyl ketone 104
- methylisothiazolinone (MIT) 1643
- N-methyl morpholine 227
- 3-methyl-1,5-pentanediol diacrylate 144
- 4-(4-methylphenylthio)-substituted derivative 223
- N-methyl pyrrolidone 110
- methyl substituted derivatives 223
- metrology 3, 8–9, 69, 769, 791, 794
- micellar system 100
- MICR inks 6, 378
- micro-discharges 877
- microelectromechanical system (MEMS)
 - MEMS fabrication 71, 482, 525, 526, 591, 598
 - MEMS products 529
- microemulsions 100, 255
- microfloat technique 608, 609
- microlens arrays (MLAs) 1219
- microlenses 1219, 1357
- microlettering 1579
- microporous tacky paper 648, 651, 652
- microporous technology 649, 650, 652
- micro-structuring, LPP 874
- microwave plasmas 875, 914, 915
- mid-tone halftone screen pattern 1193
- mild-oxidation agents 856
- miniemulsions 100
- minimum curing energy 825–827
- minimum droplet size, for ESJET 425
- Mitsubishi HiTech Paper DL 9084, 459
- modern color profiling solutions 1075
- modulation value 755
- Mohawk Industries Group 1699
- molecular weight of polymeric components 96
- monitoring droplet formation 812–815
- monoacylphosphine oxide (MAPO)
 - 215–217, 220, 235, 237, 246–248, 253, 255–257
- monochlorotriazines 848
- monodisperse drop generator (MDG)
 - 706, 707
- monofluorotriazines 848
- monofunctional acrylate monomers
 - 140–142, 144, 166, 183
- monofunctional aliphatic acrylate monomers 140
- monofunctional and difunctional UV curable alkenyl monomers 135
- monofunctional cycloaliphatic acrylate monomers 140
- monofunctional methacrylate monomers
 - 152–155
- monofunctional/polyfunctional hydroxy building blocks 139, 152
- monofunctional vinyl esters 162
- monolithic cantilever end shooter Xaar
 - 128 actuator 537
- motorcycle helmets, Omnifire 1000, 1303, 1317
- Motor Measurement System (MMS)
 - 1341
- moving drop 21, 25–30, 719
- multicolor (CMYK) robot based inkjet printing 1285–1286
- multi-cycle printing 485
- multi-drop jetting for gray level 571–574
- multifunctional amine derivative 234
- multilayer PCBs 1090, 1365, 1366, 1371, 1379
- multilevel density unevenness
 - measurement and compensation (DUMC) 760
- multimaterial/layer electric/electronic features 1288
- multi-nozzle inkjet print-head 28, 425, 552
- multi-nozzle inkjet printing 552
- multipass CMYK + color IJ press 1047
- multipass printing 73, 105, 113, 283, 290, 293, 480, 485–486, 1155, 1188, 1315, 1372, 1510
- multiple charge deflection, during CIJ
 - 468

- multiple light scattering diffusive wave spectrometers (DWS) 664
 mVroc™ viscometer 663
- n**
- nano metal inks
 copper–nickel inks 1239–1240
 gold ink 1237–1239
 photonic curing vs. thermal sintering 1240–1242
 silver ink 1236–1237
- nano-particle image velocimetry (PIV) laser 812
- nanoparticle inks 54, 82, 416, 1055, 1368, 1382
- nanoporous 648
- naphthaquinone structure 351
- Nassenger textile printer 504
- natural thickeners 853, 856
- negative ions 871, 874, 876, 882
- negative streamers 876
- nested PWA printheads, on PageWide XL printer 490
- Nestlé Guidance 319, 438, 1638
- Newtonian fluid 347, 663, 665, 668, 669, 671, 1094
- Newtonian solvent 666
- Newtonian viscosity standard N35 688
- nitrogen inertion 329, 928, 931–932
- no-label look 1532
- non-aqueous inks 100, 106, 1676
- non-axisymmetric effects 803
- non-conductive inkjet inks 1371
- noncontact maintenance 526–527
- nonequilibrium plasma 871, 877
- non-impact printing process 643
- non-intentionally added substances (NIAS) 1636
- nonionic synthetic molecules 340
- non-jettable viscosity standard N35 690
- nonlinear polymerization 825–827
- nonmetallic inks 399
- non-Newtonian inks 51–52, 408
- non-recirculating inkjet printheads 577
- non-sublimatable disperse dyes 340, 349
- non-thermal plasma 874, 895
- no observable adverse effect concentration (NOAEC) 1629
- no observable adverse effect level (NOAEL) 1627
- norm liter per minute (NLM) 878
- Norrish Type I reaction 207
- Novacentrix 10, 382, 1052, 1060, 1062, 1242, 1367
- novolac epoxy acrylates 170
- novolac resins 168
- nozzle cycling 1083
- nozzle defects 36
- nozzle plate 7, 8, 29, 36, 48, 76, 78, 127, 292, 359, 361, 366, 395, 477, 478, 506, 515–516, 526–529, 532, 539, 542, 574, 661, 662, 666–669, 676, 677, 724, 725, 801, 804–806, 809, 810, 948, 1099, 1153, 1160, 1165, 1274, 1279, 1323, 1325–1328, 1330, 1331, 1493, 1574, 1576, 1686
- nozzle sensing 810–812
- nozzle spacing 28, 36, 80, 86, 482, 528, 1324, 1607
- number of nozzles, evolution of 497
- N-vinylcaprolactam (NVC) 159, 176, 183, 286, 328
- nylon 3D printing, with HP Mutijet Fusion Technology 495
- Nyquist's theorem 764
- o**
- 1,8-octanedioic acid divinyl ester 162
- odor 104, 138–140, 168, 175, 178, 180–183, 235, 237, 238, 242, 244, 260, 326, 334, 440, 836, 856, 1013, 1207, 1517, 1634
- offset printing 68, 98, 112, 329, 330, 457, 845, 994, 1011, 1190, 1204, 1205, 1207, 1209, 1221, 1579
- off-the-shelf image analysis algorithms 813
- Ohnesorge number (Oh) 5, 50, 52, 110, 135, 136, 394, 395, 498, 696, 1695
- Ohnesorg equation 406–408

- oil ink 106, 513, 577, 579, 1187
 - oil-in-water microemulsions 100
 - oligomers 286, 303, 910, 983
 - monoacylphosphine oxide derivative 235
 - type gels 1190
 - Omnifire 1000 12, 1274, 1311–1314, 1316, 1317
 - omnipresent dye-based ink formulations 100
 - on-demand piezoelectric industrial inkjet printheads 571
 - one pass printing 485
 - on-time compensation system 1199
 - open waveform architecture 526
 - optical glass 616–617
 - optical imaging standards 718–721
 - optical power Specifications 939
 - optimized jetting parameters of the printhead 406, 408–409
 - optimized kinematic model 1345
 - optimum viscoelasticity 666, 669
 - optoelectronic devices
 - metal grids as supply for transparent electrodes 415–417
 - organic electronic devices 6, 405, 430
 - organic field effect transistors (OFETs) 1214–1216
 - organic light emitting device (OLED)
 - displays 6, 405, 408–412, 416–423, 425–428, 517, 695, 707, 708, 714, 1203, 1218, 1219, 1225
 - inkjet printing of 417–422
 - polymer SPR-001 410–411
 - stack structures for 417–418
 - organic photovoltaic (OPV) devices 1219
 - inkjet printing 421–422
 - stack structures for 417–418
 - organic residue removal 885
 - organic semiconductor (OSC) 1215, 1216
 - organic solvents 71, 104–105, 109, 264, 340, 417, 429, 1422
 - organic thin film transistors (OTFT) 695, 1247
 - ORMOCER® based freeform 1409, 1415, 1416
 - osseointegration 1294
 - Oswald viscometer 663
 - OTFT semiconductor 1247
 - outdoor sign and display 636–637
 - Overall Migration Limit (OML) 1630
 - overprinting 112, 291, 1074, 1178, 1233–1234, 1570
 - overprinting methods 1570
 - oxazine 305, 341
 - oxime ester 220
 - oxygen inhibition, UV curing process 931
 - ozone production 876, 883–885
- p**
- packaging as a system 6, 438–440
 - packaging, in industrial UV printing systems 293
 - packaging printing
 - brand and customer connections 1504
 - demographic trends and inkjet capabilities 1503
 - inkjet press priorities 1504
 - specifics and challenges of 1074
 - pad liquor recipe 854, 855, 861
 - page description language (PDL) 427, 1068
 - PageWide Array (PWA) nestable
 - printhead module 488–491, 498
 - pagewide printhead configurations 487
 - page-wide printing, printheads for 486–488
 - pagewide TIJ system, engine architectures for 487
 - paint signal 809, 816
 - paper
 - bulk properties 642–643
 - definition of 641
 - film forming coatings 646–647
 - future developments and innovations 652
 - laminates and composites 647–648

- paper (*contd.*)
 - physico-chemical interaction of inks 644–646
 - porosity and ink penetration 644, 645
 - porous coatings 646
 - sublimation 648–652
 - wetting and surface properties 643
- paper/Ag (inkjet)/Al4083/SY/Ca/Ag stack layout 417
- paper for recycling 449, 450, 455, 456
- paper recycling
 - deinking process 451–452
 - different processes 450
 - importance in Europe and the US 449
 - value chain and its challenges 449
- paper, spectral absorption, reflection and transmission characteristics of 1032
- paper substrates, for OLED fabrication 416
- parabolic reflector 923
- partially automated processes 1456
- particle/pigment-based inkjet inks 100
- particle size
 - making jettability wider 559–560
 - measurements 697
- particle tracking velocimetry 805
- Parylene 510, 511, 520
- patent(s) 15, 1672
 - definition 1699–1700
 - purpose of 1700
 - social contract 1700
- PCB production
 - inkjet-printed solder resist
 - advantages 1257
 - flexible solder resist 1259, 1260
 - rigid soldermask 1260
 - legend printing 1256–1257
 - printing of polyimide 1267
- PDF/X files 1070
- peak irradiance 211, 923, 934, 939–941, 943, 947
- PEDOT:PSS 410
 - as electrode for medical applications 414–415
 - as hole injection layer for printed OLEDs 411–412
 - molecular structure 411
 - for OPV applications, highly conductive 412–414
- penetration depth, UV radiation 780–786
- pentaerythritol (PE) 144, 172, 313, 333, 388, 504, 839, 895, 959, 995, 1287
- pentaerythritol triacrylate (PETIA) 144, 172, 959
- perception of color 1071
- Pergo® 1545
- Persistent, Bioaccumulative and Toxic (PBT) 1640
- personalization of laminate designs 1548
- PFN flash lamp systems 1053
- PFN-based traditional flash lamp systems 1053
- pH 47, 48, 107, 109, 179, 334, 426, 442, 483, 498, 524, 662, 854–856, 884, 1118, 1357, 1626
- pH sensitive inks 48
- pharma blister pack 300
- phase-change inks 99, 113
- phase Doppler interferometry (PDI) technique 8, 696, 700–708, 711–714
- phenyl acrylates 285
- 4-phenylbenzophenone 223, 226
- phenyl bis(2,4,6-trimethylbenzoyl)-phosphine oxide 1628, 1633
- phenylglyoxylate esters 219
- photoacid generators (PAG) 200
- photobase-catalyzed UV inkjet inks 260–269
- photobase generators (PLB) 200, 260–269
- photoinitiator(s) 5, 98, 126, 128, 180, 203, 288, 304, 780, 1004
 - cationic inkjet formulations 258–260
 - historical background 199–202
 - low migration food packaging 228–245

- photobase-catalyzed UV inkjet inks 260–269
- UV curing of water-based formulations 252–257
- UV LED 202–203
- UV LED curing 245–252
- UV radical curing system 204–207
- photoionization 876
- photolatent bases (PLB) 203, 260–269
- photoluminescent color converter (PL) 429–430
- photonic curing
 - advanced parameters of 1059–1060
 - description 1051
 - of inkjet printed nanoparticle silver ink 1055, 1056
 - and inkjet printing, integration of 1055–1058
 - in-situ* resistance change measurement 1054
 - nano-copper particles 1058
 - operating controls 1054
 - vs. oven annealing, trace resistivity for 1056, 1057
 - processing of
 - inkjet printable flake containing functional inks 1061
 - polymetric dielectrics 1061
 - semiconductor and ceramic inks, high temperature processing of 1061–1062
 - Simpulse® 1060
 - soldering components onto printed circuits 1061
 - thermal simulator 1054
 - vs. thermal sintering 1240–1242
- photonic sintering 1369, 1370, 1375
- photopolymerization process 127, 200, 216, 769, 771, 774, 786
- photopolymer jetting 127, 552
- photosensitive glass 620–621
- physical security measures 1084
- piezo-acoustic sensing 809
- piezo activated torsion resonator 664
- piezo actuator 475, 476, 504, 514–515, 519, 682, 687, 807, 809, 812, 816, 1682, 1685, 1687
- Piezo Axial Vibrator (PAV) 663–665
- piezo based actuators 72
- piezo-driven DOD print heads 1373
- piezo drop-on-demand 523, 525
- piezo electric actuator 105, 108, 801, 808, 809, 812, 1121, 1534
- piezoelectric direct discharge 880
- piezo-electric effect 809
- piezoelectric industrial printheads 105
- piezoelectric inkjet (PIJ)
 - drawback 469
 - factors affecting drop ejection consistency 477–478
 - greyscale printing 470, 474, 475
 - multi-drop printing 473
 - printhead designs 470
 - printhead operation 470
 - scaling firing chambers 478–480
 - triple drop operation 473
- piezo-electric inkjet devices 660
- piezoelectric shear mode actuation 537
- piezo element 408, 469–472, 477, 479, 560, 562, 1121, 1198, 1372, 1431
- piezo inkjet (PIJ) printheads 467, 469–485, 487, 498, 1083, 1465, 1466, 1468, 1472, 1473, 1476, 1478, 1679–1682, 1684, 1686
- piezo inkjet technology 72, 802
- piezo printheads 7, 283, 291, 457, 559, 634, 687, 815, 1675, 1679–1683, 1695
- pigment(s) 126, 180, 304, 364, 983
 - aggregation 304, 311–313
 - based inkjet inks 457
 - based inks 96, 100, 107, 110
 - containing inks 48
 - dispersant 304
 - dispersion method 1549
 - inkjet ink formulations 856
 - inks 99, 102, 347, 370, 378, 458, 596, 848, 851, 852, 856–858, 1689

- pigmented black ink 1572
- pigmented inkjet printing 455
- pixel-to-nozzle mapping 760, 764
- planar printing 1301, 1303, 1306, 1307
- plasma applications
 - aerosol jet printing 897
 - inkjet hybrid printing platform 896–898
 - marking and coding 895
- plasma-based coating methods 886–887
- plasmabrush 879, 886, 887, 891, 892, 897s
- plasma chamber 870, 871, 875
- plasma enhanced chemical vapor deposition 886
- plasma formation 870–871
- plasma needle 878, 880
- plasma pencil 878
- plasma polymerization 885, 886
- plasma pre-treatment 9, 410, 414, 415, 895, 896, 1233, 1527
- plasma properties 868, 871–874
- plasma sheath 873
- plasma spraying 874, 886, 887
- plasma surface interaction 872–873
- plasma surface modification 874
- plasma surface treatment
 - organic residua removal 885
 - reduction 885–886
- plastic foils, spectral measurements of 1033
- p-n junction semiconductor 918
- Pointillism 1188
- poly(acrylic acid) 103
- polyamide-imide 894
- polybutylene terephthalate blend
 - substrates 1242
- polycarbonate 894
 - digital printing
 - drops in flight 1574–1577
 - forensic equality 1577
 - motivation 1571–1574
 - satellites 1577
 - inkjet topography 1570
 - materials 1569
 - post-personalization vs.
 - pre-personalization 1570–1571
 - secure color personalization of 1571
- poly-DADMAC (poly-diallyl-dimethylammonium chloride) 645
- polydimethylsiloxane 388, 894
- polyester 100
 - acrylate oligomers 170–171, 173
 - textiles 345, 846, 847, 855, 858
- polyether containing monomers 331–332
- polyether polyols (PEPO) 348
- polyethers and alcohols 332–333
- poly(3,4-ethylenedioxythiophene) 411, 499, 896
- poly(ethylene glycol) diacrylates (PEGDA) 331, 334
- poly(ethylene glycol)s (PEG) 108, 177, 332, 414, 1470
- polyethylene-glycol substituted
 - bisacylphosphine oxide structures 235, 255
- polyethylene naphthalate 896
- polyethylene terephthalate (PET) 313, 345, 377, 388, 440, 839, 896, 1242, 1319, 1521, 1531
- polyfunctional aliphatic 168–170, 172
 - and cycloaliphatic alcohols 168
 - cycloaliphatic alkene compounds 168–170, 172
- polyfunctional glycidyl ethers 168
- polyfunctional hydroxy terminated
 - polyester prepolymers 170, 171
- polyfunctional hydroxyacrylate
 - monomers 172, 173, 178, 179
- polyfunctional isocyanate terminated
 - polyurethane prepolymers 172, 174, 178
- polyfunctional phenolics 168
- Polyjet® 99, 1427, 1430–1432, 1444
- Polyjet component 1430
- Polyjet (Multijet) technology 99
- polyjet printer 1432
- polyjet process 1430
- Polyjet technology 99

- polyketone resins 106
- polymerization grade 825, 827–835, 840
- polymers 457
 - based inks 499, 1211
- poly(methyl methacrylate) (PMMA)
 - 894, 972, 974, 1236, 1238, 1239, 1287, 1404, 1409, 1493
- poly(*N*-vinyl-2-pyrrolidone) (PVP) 103, 426, 1370
- poly(propylene glycol) diacrylates (PPGDA) 331–333
- poly(propylene glycol)s (PPG) 332
- polypropylene (PP) food cup 295
- polystyrene (PS) 411, 499, 670, 894, 1236
 - solutions 670
- polytetrafluoroethylene 895, 1155
- polythiophene 421, 422
- polyurethanes 106, 348, 860
 - acrylate oligomer dispersions 178–180
 - polymers 106
- polyvinylpyrrolidone (PVP) 103, 426, 1370
- porcelain and tableware industry 359
- porosity 626, 627, 642, 644, 646, 846, 1294, 1550, 1559
- porous coatings 646
- Portable Document Format (PDF) 10, 760, 1068–1070, 1080, 1211
- positive air-cooling 930
- positive digital embossing 1708, 1709
- positive ion(s) 868, 871–874, 876, 882
 - concentration 871
 - temperature 872
- positive streamers 876
- post process, heat treatment 1451
- PostScript 10, 626, 1068–1070, 1080, 1717
- powder-bed 3D technology 100
- power and control cabling 920, 926–927
- power density 873, 879, 885, 939
- precise adjustment, of print heads
 - 1197–1198
- Pre-Manufacture Notice (PMN) 1630
- pre/post processes 3, 9–10, 867–898, 1436
- pre-treatment/priming for digital textile printing 852
- pregreg 1090
- preservative 98
- primary electrons 1012
- Primer IP 1707–1708
- primers
 - effect of 458
 - inkjet 567–568
- priming, in industrial UV printing systems 290
- printbar, description 487
- printed antennae 87
- printed antennas on mold package
 - 1243–1244
- printed batteries 87–89
- printed circuit boards (PCBs) 695, 1089, 1233, 1365
 - classification 1090
 - components 1090
 - data handling 1105–1106
 - definition 1090
 - inkjet 1096–1105
 - machine concept 1106
 - pregreg 1090
 - solder mask 1091–1094
- printed circuit, structure of 1268
- printed decor paper 1172, 1174, 1546, 1548, 1707, 1710
- printed electronics 11, 12, 1273, 1617, 1619
 - analog printing technologies 1203
 - additional technologies 1209
 - flexo printing 1207–1208
 - screen printing 1205–1207
 - analog printing vs. inkjet printing decision criteria technology
 - 1220–1222
 - flexography-printing resolution
 - 1223–1224
 - inkjet-printing resolution 1224
 - right technology 1227–1228
 - screen-printing resolution
 - 1222–1223

- conductive pattern requirements 387
 - adhesion 387
 - electrical properties 387
 - geometry 387
- electronic devices 6
- functional printing vs. graphical printing
 - building picture 1211–1213
 - techniques 1209–1210
- graphical and functional inks 1210–1211
- industrial applications 382
- lens-arrays 1219–1220
- market size estimations 382
- materials 1368–1371
- printed layers 1210
- printed microlenses 1219–1220
- printed pressure sensors 1213–1214
- printed solar cells 1219
- printed transistors 1214–1218
- screen printing 1371
- system 893
- printed heater 1242–1243
- Printed Interior Decoration (PID) 293
- printed metal lines
 - conductive adhesive 1235
 - overprinting 1233–1234
 - soldering 1234–1235
 - spring contacts 1235–1236
- printed microlenses 1219–1220
- printed pressure sensors 1213–1214
- printed resolution 80, 81, 1139
- printed silver grid structure 416
- printed solar cells 421, 1219
- printed strain sensors 1245–1247
- printed strain sensors on foil 1245–1247
- printed temperature sensors 1244–1245
- printed transistors 1214–1218
- Printek printheads 557–559
- print frequency and drop volume 71–72
- print gap, making jettability wider 561
- printheads
 - capabilities and applications 530
 - design 571–576
 - invention curve 557
 - module 487–489
 - nozzle 49
 - Seiko RC1536 567
 - service station 1395–1396
 - servicing tasks 490
- printing gap distances 19
- printing industry 95
 - coating applications 995–996
 - converting and product enhancement 996
 - décor printing 998
 - equipment 992
 - flexo printing 994
 - inkjet printing 994–995
 - lamination 996
 - offset printing 994
 - 3D printing 998
- printing self-recovery 542–544
- printing strategies 14
 - additive manufacturing 1588–1591
 - custom marketing 1591–1592
 - overview 1585–1586
 - security printing 1587–1588
- printing three-dimensional objects 1302, 1307, 1308
- printing through 28, 491, 1205, 1393
- print quality (PQ) 731
 - analysis system 733
 - assessment 373, 395, 590, 732, 1332, 1606, 1616, 1620
- print quality control
 - camera calibration 758–760
 - density unevenness compensation 762–763
 - density unevenness measurement 761–762
 - malfunctioning nozzle compensation 765–766
 - malfunctioning nozzle detection 763–765
- print quality defect (banding/streaking) 8, 588
- print quality methods 731–736
- print speed test 565
- print target 751–753, 755

print through 46, 592, 594, 596, 1205
 proactive licensing 15, 1700–1702
 Process Analytical Technologies (PAT) 696
 Process IP 1706
 product handling 989, 1002
 product printing 292
 product quality control 1016, 1054
 PROFACTOR RoboJet System 69, 1271–1275
 communication 1283
 in-process UV pinning 1283–1284
 pre-processing 1280
 print swath stitching 1284–1285
 processing 1280
 substrate pre-treatment 1281–1283
 workflow 1279–1280
 propanol 107, 115
 proportionality constant 697, 780
 propoxylated glycerol triacrylate (GPTA) 959
 propylene carbonate 104, 1633
 propylene glycol methyl ethers 108
 pulsed atmospheric arc 878–880
 PulseForge® 1052, 1054, 1062
 pulse shaping 10, 1054, 1057, 1061
 pulse voltage 51, 52, 408
 2-Pyrillodone (2P) 443
 pyrogenic silica or alumina 646
 Pyrosil flaming 1283

q

QSAR (Quantitative Structure–Activity Relationship) modelling 1626
 quality assurance 13, 494, 1093, 1444–1459, 1597, 1710
 quantization error 762
 quantum dots (QD), inkjet printing of 422–425
 quartz 357, 878, 914–915, 917, 920, 924, 964, 967, 1035–1036, 1077, 1539
 quick and dirty methods 837
 quick change cassette 920, 928, 930
 quinophthalone 340–341

r

radiant exposure 772–774, 778–779, 788–791, 793–794, 796–797, 1053, 1057, 1059–1061
 radiation based drying systems 1038
 radiation heat transfer 1030–1031
 radiation shielding 1015–1019, 1025
 radical photoinitiators 199, 260, 262, 267–269
 radical photopolymerization 5, 126–128, 134, 140, 155, 159–162, 165–167, 175, 769, 771, 781, 786
 and radical stability 130–132
 radical polymerization mechanism 986, 1370, 1374
 radio frequency discharge 875
 radiochromic films 787–790, 796
 radiometer 796
 data 795–797
 terminology 772–774
 rainbow rolls 1548, 1705
 Rapid Alert System for Food and Feed (RASFF) 228
 Rapid Manufacture 1354
 rapid pinning technology
 necessity of 1188–1189
 for UV-curable ink 1189–1190
 rapid prototyping 127, 801, 1063, 1219, 1354, 1367, 1418–1420, 1422
 rapid tooling 127
 rapid warm up/cool down 928, 930
 raster image processing/processor (RIP) 10, 79, 343, 346, 599–600, 1067–1070, 1074–1076, 1078–1080, 1083, 1113, 1144, 1158–1159, 1533
 Rayleigh–Taylor-like mechanism 804
 Rayleigh–Plateau instability 806, 815, 1695
 reactive CuO based inks 1052
 reactive inkjet printing 853–855, 1158
 reactive inks 106, 344, 346, 848, 851, 1052, 1358
 reactive licensing 15, 1700, 1702
 recirculating ink supply system 1153
 recoverability 47–48, 54

- rectified diffusion 105, 807, 1154
- re-distributed manufacturing concept 494
- Red X Dot Corporation (RXD) 369
- redundant nozzles 489, 588, 591, 1082, 1395, 1516
- reference electrode (RE) 1249–1250
- reflectors, UV lamp 796, 916, 920, 922–923, 928–929, 1033, 1035
- refrigeration dryer 881
- Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) 114, 223, 228, 317, 443, 1630–1631, 1633, 1639–1640, 1643
- regulated markets
 - cosmetics 1638
 - electronics 1639
 - food packaging and food contact materials (FCM) regulatory regimes 436–437
 - ink chemist and regulatory team relationship 444–445
 - ink development framework 442–444
 - ink formulator's dilemma 440–442
 - manufacturing control 445–446
 - medical devices 1638
 - packaging as a system 438–440
 - positive vs. negative lists 437–438
 - toy safety 1639
- Regulation (EC) No 1935/2004 437, 951–952
- Regulation (EU) No 10/2011 (European Union 2011) 952, 1629, 1636
- relief printing 1204–1205, 1207, 1208
- repetition time 813
- reprototoxic photoinitiators 1626, 1642
- required drying times, for drying technologies 1041
- resolution, printing 1381–1382
- Reynolds number 5, 20–21, 28–29, 49–51, 54, 74, 110, 135, 394, 395, 407, 696, 1467
- RFID equipped bag-in-box systems 1525, 1526
- Rheology of ceramic inks 359–360
- rheology control 107
- RICOH MH5421F printheads 78
- rigid soldermask
 - automatization 1261–1264
 - data conversion 1265–1266
 - resolution and rasterization 1265
 - UV-pinning/UV-curing 1266–1267
- robot based inkjet printing system
 - application driven motivation 1272–1273
 - print image calculation 1277–1279
 - printing of biomaterials 1294–1295
- PROFACTOR 1273–1275
- Profactors RoboJet System
 - communication 1283
 - curing, sintering, drying 1286
 - cycle time 1284
 - in-process UV pinning 1283–1284
 - multi-color (CMYK) robot based inkjet printing 1285–1286
 - post-processing 1281
 - pre-processing 1280
 - precision 1285
 - print swath stitching 1284–1285
 - printed level sensor 1282, 1287–1288
 - processing 1280–1281
 - specifications and performance 1286–1287
 - substrate pre-treatment 1281–1283
 - workflow 1279–1280
- 2,5D printed electronics 1288–1290
- zero defect robot based inkjet printing 1291–1293
- robot calibration
 - absolute calibration 1345
 - absolute inline calibration 1345
- ROCO 1344
- roll-to-roll (R2R/RTR)
 - environment 29, 1371
 - inkjet press 1548–1549
 - inkjet printing 337
 - printing application 834
 - tool 616

- rotary screen printing 1207
- rotating shutter 926
- rotogravure printing machines 1172
- S**
- safe operation area (SOA) 825–826, 831
- salt mist test 398
- Samba printhead 531–532
- sand duning 31
- Saphira Digital UV-curable ink 304
- satellite drops 21, 24, 49, 51, 135, 407–409, 657, 661, 670, 673–697, 748, 802–804, 806–807, 1123–1124, 1137, 1139, 1141, 1145, 1162, 1576–1577
- satellites/mist 724
- Scalable Printing Technology (SPT) 484–489, 1082
 - elements 484
- scanning beam systems 990
- scanning multi-pass printing, printheads for 485–486
- scanning print modes 486
- Schwarzschild exponent 825
- screen printing 384, 845, 1205–1207, 1272, 1371
 - achievable resolution 86–87
 - fine line printing 89
 - flatbed 82
 - layer thickness control 84–86
 - printed antennae 87
 - printed batteries 87, 88
 - variants of 83–84
- screen-printing resolution 1222–1223
- sealed compact emitters 989–990
- secondary electron emission 872
- secondary electrons 872, 876, 956, 961, 983, 1012
- second-generation Memjet printhead
 - design elements 587, 593, 594
- security printing 10, 14, 81, 369–378, 1120, 1144, 1569–1581, 1586–1589, 1591–1592, 1692
- Seiko Holdings Group 555
- Seiko Instruments Inc. 555, 556
- Seiko RC1536 7, 559–562, 565–568, 1493
- selection of the pigments 308, 1550
- semiconductor processing technology 529
- sequestering agents 108–109, 855–856
- service life, UV lamp 928, 930, 1460, 1538
- setoff ink substances 836–837
- setup, test 563
- shadow drops 49
- shared wall actuator design 538
 - single cycle mode 539–540
 - three cycle mode 538–539
- shear-mode based printheads 73
- shear-mode/shared wall inkjet printhead 578
- shielding, EB system 1001–1002
- short strobe pulse 719–720
- shutters, UV light 924–926
- Sicrys™ nanosilver particles 392
- sideways movement 1125–1128
- sigma-delta modulation 762
- single side KCMY-color printed IJ process 1042
- SII Printek Inc. 555–557, 562
- silicon-based softening agents 860
- silicones 357, 853, 1404
- silver 398–399
 - inks 381, 389, 392, 1055, 1227–1228, 1231, 1236–1237, 1240–1241, 1244–1245, 1247, 1249–1250, 1368–1370
 - nanoparticle-based inks 416, 1055, 1412
- silyl glycolates 250
- simplified inkjet printhead 46
- SimPulse® 1055, 1060
- simulation method, for piezo inkjet chamber design 479
- single cavity printhead 503
- single color assessment 747–748
- single drop wakes 26–28
- single event 719, 720, 1599
- single event capture systems 1602
- single-filter radiometers 790–791

- single flash imaging software 1599–1600
- single mode linearly polarized laser
 - 701–702
- single-nozzle experimental system 48
- single pass printing 105, 113, 282–283, 290, 479, 489, 513, 550, 552, 579, 947, 1083, 1152, 1155, 1168, 1177–1182, 1185, 1187–1188, 1190, 1195, 1372, 1421, 1676
- sintering process 97, 397, 1058, 1241, 1360, 1370, 1375, 1379
- SINUMERIK 840D sl
 - G-code 1336
 - MAX-100-2.25-P benefits of 1349
 - secondary encoders 1335–1337
 - system overview 1336
 - technical data 1338
- skew adjustment, of print head 1197
- skyscraper mode 551–552, 1319, 1533
- sliding door shutter 926
- small-size APPJ 878
- smartINK™ Solution 371–372, 378
- social contract 1700
- soda-lime glass 607
- sodium alginate/seaweed 853
- sodium bicarbonate 484, 853–854
- sodium carbonate 848, 853–854
- sodium guar gum 855
- soft segments 172, 177
- software, industrial print hardware
 - 1067–1080
- software RIPs 1069
- software/data 10
- solar cells 6, 65, 68, 89, 91, 104, 114, 382, 412, 421–422, 695, 1219
- solder mask
 - chemical 1095–1096
 - definition 1090–1091
 - electrical 1096
 - environmental requirements 1096
 - inkjet-printed structures 1106
 - PCB 1091–1094
 - physical 1095
 - soldering/mechanical 1096
 - visual 1095
- solid UV inks 281–282, 288
- Solidscape Inc 1355
- Solsperse 103
- soluble salt (metal organic complexes)
 - inks 360
- solvent-based ceramic inkjet ink
 - formulation 118
- solvent-based ceramic inks 360–361
- solvent-based conductive inks 104
- solvent-based inks 48, 99, 110, 1571
 - ink formulation 117
 - inkjet inks 104, 125–128, 1374
- solvent selection 399, 1481
- sorbitol 108
- soybean oil 169–170
- spark ignition 875
- specific migration limit (SML) 216, 229–232, 297, 437, 838, 952, 961, 962, 1629
- spectral absorption measurement, of dry ink on paper 1037
- spectral intensity distribution, of
 - IR-heating sources 1031–1032
- spectral measurement
 - of pigmented dried ink on quartz glass 1036
 - of pigmented wet inks between quartz glasses 1035
 - of water film between quartz glass 1036
- spectral radiometers 793–796
- Speed2Market 1521
- splashing parameter 26
- splice avoidance 1142
- SPME/GCM 958–962, 964
- spot color data characterization 1074
- spring contacts 1235–1236
- sputter deposition 873
- sputtering 415, 514, 872–873
- sputter limit 873
- squeeze flow rheometers 663, 679
- S-RACE Tacky 652
- stabiliser 48, 103, 107, 110, 289, 304, 311, 352, 961–962, 1237, 1374, 1531

- Stainless Steel 3D Printing with HP's Metal Jet Technology 496–497
- stakeholders 452, 1631
- standard gravure press 1557
- standard jettable viscosity inks 682
- standard liter per minute (SLM) 878, 1392, 1397, 1398
- standard UV inkjet inks 296–298
- standardisation 4, 14–15, 1228, 1268, 1602, 1639
- StarFire SG 529–531
- statement of composition (SoC) 840, 1636
- static misalignments 1156
- static stabilization mechanism 103
- Stäubli TX-60* 6-axis robotic arm 1321
- steady shear rheology 663
- steady shear rheometers 663
- steady-state Couette velocity profile 29
- stereolithographic (SLA) 495, 1429–1431, 1434
- Stokes drag force value 21
- strain/stress-controlled rheometer 663
- Stratasys® material ABSplus 1451
- stray light 937, 948–949, 1632
- stray radiation sources 1003
- stretch/skew 732, 735
- strobe flash systems 1602
- structural electronics 1365–1376
 - conformal printing 1377–1383
 - hybrid 3D printing 1378
 - laser direct structuring (LDS) 1378
 - in mold electronics (IME)/injection molded structural electronics (IMSE) 1377
- styryl 341
- sub standards, PDF 1069
- sub-licensing program 1703–1704
- sublimation colorants 340–342, 344
- sublimation dye inks 343, 347
- sublimation dyes 337, 339–345, 347–349, 351–352
- sublimation inkjet inks 6, 337–353
- sublimation inks 6, 106, 338–340, 342–344, 648
- sublimation paper
 - application 651–652
 - product design and technology 648, 650
 - two-step printing technology 648
- sublimation thermal transfer printing 337
- Substance of Very High Concern (SVHC) 223, 1639–1640, 1642
- substrates 7
 - adhesion 6, 313–314
 - barrier performance 6, 439–440
 - heating 514, 1037–1039
- subtractive processes 382, 885, 1231
- sulfonium salt photoinitiators 259
- α -sulfonyl ketone 226
- sulphonated high molecular weight polymers 343
- sulphonated lignin 343
- sulphonated naphthalene condensate 343
- Supermatt surfaces 172nm excimer-curing of acrylate formulations
 - industrial excimer matting units 971–973
 - surface micro-folding 966
 - UV-precuring and excimer matting 969–971
 - xenon excimer lamps 966–969
 - xenon excimer source 964–966
- surface activation 887–889
 - activation area, visualization of 889
 - activation rate 890–891
 - hydrophobic recovery 893–895
 - over-treatment 891–892
 - wetting control 892–893
- surface active components as primer layer 410
- surface barrier discharge 877
- surface diffusion 873
- surface free energy (SFE) 9, 823, 868, 883, 887, 889–890, 892–895, 1214, 1360
- surface manufacturing 495, 499–500, 1585

- surface modification 397, 876–877, 885, 1281
 - surface-mounted devices (SMDs)
 - inkjet-printed Ag lines soldering 1234
 - printed silver structure 1235
 - surface roughness, in OLED applications 410
 - surface tension, in inkjet ink 660–661
 - surface tension coefficient 49
 - surface treatment, vibratory finishing 1456
 - surfactants, ink additives 107–108
 - sustainability 4, 15, 114, 298, 438, 717, 727–728, 848, 1005, 1152, 1154, 1355, 1503, 1522, 1640, 1649–1666
 - sustainable development 1649
 - Suzhou RuiFa Printing Technology Co. Ltd 1676
 - Swellable Technology 649, 652
 - Swiss Federal Department of Home Affairs (FDHA) 317, 1629, 1636
 - Swiss Ordinance SR 817.023.21 229, 233, 259, 437
 - switchboard 812–813
 - synthetic polyacrylic acids 853
 - synthetic polymeric binders 860
 - synthetic thickeners 853–854
 - system integrators 1151, 1160
 - system testing 740, 742, 1167
 - system-in-foil (SiF) 1247–1248
 - systems engineering 740–742
 - systems life cycle 1665
- t**
- temperature shock test 398, 1235
 - Tersperse 103
 - Tessellation and Recombination pattern 1585, 1586, 1590, 1591
 - Test Method EM401 461
 - test methodology 562
 - test print parameters 562–563
 - tetrachloro auric acid (HAuCl₄) 1237
 - tetradecane 104
 - tetrafunctional and hexafunctional acrylate monomers 149–151
 - tetrahydrofurfuryl acrylate 140
 - 2,2,6,6-tetramethyl piperidine 352
 - Tetrapak 323, 324
 - textile and apparels 1272–1273
 - textile inkjet inks and dye-textile interactions 848–852
 - textile manufacturing 847
 - textile roll-to-roll printing 1075
 - text quality 736
 - TF technology 542
 - air and debris removal from ink channels 542–544
 - heat removal from actuator 544
 - ink supply to nozzle 544–547
 - recirculation path 547–548
 - Theiler–Rrahimi constant 827
 - thermal drying process 1037, 1039
 - thermal inkjet (TIJ)
 - firing chambers and process implementation 480–483
 - fluids for drop ejection 483–484
 - MEMS printheads 7
 - patent 1672
 - printheads 1082, 1674, 1675, 1678
 - thermal inkjet technology (TIJ) 435, 585–602, 1400, 1506
 - thermal plasma 874, 895
 - thermal polymerization 6, 304, 310–311, 1039
 - thermal sintering vs. photonic curing 1240–1242
 - thermal transfer mechanisms 1029–1037
 - thermodynamic equilibrium 152, 872, 877
 - thermoplastic 851, 894, 1074, 1234, 1250, 1356, 1417, 1444, 1445, 1531, 1571
 - thickeners 853–856
 - thin film deposition 499, 874, 886, 1727
 - thin film encapsulation (TFE) 695
 - thin film piezo actuator 504, 514–515, 519
 - thin glass technologies 608

- thin-film PZT technologies (Si-MEMS)
 - 72, 1680, 1681, 1684, 1688, 1695, 1696
- thioxanthone(s) 209, 212, 224, 227, 242, 247
 - derivative 219, 220, 223–225, 230, 234, 244, 246, 247
- three cycle firing, for a Xaar 1003 actuator 539
- 3D printable materials 1451–1452
- 3D printed dental prosthesis 581
- 3D printed substrates 1247–1249
- 3D-printers 495, 496, 552, 998, 1355, 1391, 1393, 1401, 1419, 1421, 1430, 1436
- 3D printing 12, 127, 494, 581, 998
 - additive manufacturing 1393–1394
 - automotive industry 1427–1461
 - availability 1399
 - definition 1393
 - HP metal jet, MIM industry 1400
 - HP metal jet process 1396–1397
 - HP metal jet technology 1394
 - HP metal jet vs. metal injection molding 1398
 - HP Multi Jet Fusion 1391
 - HP's open platform 1399
 - HP thermal inkjet printheads 1395–1396
 - metals for HP metal jet 1397–1398
 - New AM Campus in Barcelona 1399
 - nylon 495–496
 - software for HP metal jet 1398–1399
 - stainless steel 496–497
 - Xaar applications in 552
- 3D printing/additive manufacturing commercially attractive enabler in 1353–1355
 - future for 1362–1363
 - inkjet printing and reaction 1355–1358
 - sintering 1358–1362
- 3D-printing of optics
 - illumination applications 1408
 - inkjet-printing 1404–1411
 - material considerations for 1404–1405
 - ORMOCER[®]-based freeform 1415
 - potential approaches 1412, 1415
 - printed bulk volumes 1408, 1410
 - requirements for 1405–1408
- threshold arrays 1159
- Threshold of Regulation (TOR) rule 437, 440, 1637
- tiger striping 31
- tile industry 6, 102, 106, 357–359, 361, 363, 367, 566, 846–848, 851, 861–864, 1072, 1075, 1272
- time-resolved FTIR(ATR) 958, 959, 965, 969, 971
- 4-times nozzle redundancy 1395
- titanium dioxide 286, 287, 306, 320, 642, 1626, 1642
- titanocene 220
- tolerances and scaling 1436–1438
- toluene 104, 250, 418, 483, 1480
- Tonejet inks 68
- Tool Center Point (TCP) 1325, 1327, 1337, 1341, 1347
- top-down structural electronics 1371, 1379
- torque pre-control method 1344
- Toshiba Tec printhead technology
 - inkjet printhead with real-through channel recirculation 578–580
 - jetting capability of high viscosity 580–581
 - non-recirculating inkjet printheads 577–578
 - printhead design 571–576
 - product outline 569
 - 3D printing 581–582
 - ultra-compact ink recirculation system (CC1) 580
- total required energy, for thermal drying systems 1037, 1038
- touchscreen application 615–616
- Toxic Substances Control Act (TSCA) inventory 1630, 1640, 1643
- toxicological evaluation 15, 1626–1630

- toxicologically critical N-vinyl caprolactone 209
- toy safety 1639
- trade secrets, Unilin 1551, 1566, 1672, 1705, 1709, 1710
- traditional electronic methods 1203
- transfer media 6, 338, 339, 341–347, 349, 352
- transfer printing method 345, 855
- transfer vs. direct printing 349–351
- transistor, on flexible foil 1215
- tributylphosphate 108
- trichloromethyl triazine derivative 220
- tricyclodecane dimethanol diacrylate 144
- tricyclodecanemethanol acrylate 182
- triethanolamine 115, 227
- triethylene glycol divinyl ether 158
- trifunctional acrylate monomers 144, 147–149
- trifunctional methacrylate monomers 155, 158
- 3,3,5-trimethylcyclohexyl acrylate 140
- trimethylol propane (TMP) 333
- trimethylolpropane triacrylate (TMP(EO)_nTA) 144, 149, 177, 256, 331, 359
- TriPAV 663, 664, 670, 671, 679–685, 689, 690
- complex rheology 689
- step strain printhead mode analysis 679–682, 684, 685, 689
- triple flash systems 1602
- tripropylene glycol diacrylate 164, 213
- 2D electrode array 1249
- 2.5D printing 10, 1079–1080
- 2.5D substrate photography 1250
- type I photoinitiators, UV radical curing 207
- type II photoinitiators, UV radical curing 220
- type II photoinitiators ITX 212
- typical pad liquor recipe 854–856, 861
- U**
- ultra-compact ink recirculation system (CC1) 580
- ultra high frequency radio-frequency identification (UHF RFID) 1225
- ultra-low energy electron beam (ULEB) sources
- conventional high energy EB and low energy EB process 1017–1018
- definition 1011
- depth and dose distribution 1019–1021
- EB inkjet printing with 1018
- technical challenges 1021–1022
- ultrasonic bath 412, 1442, 1457
- ultrasonic swing lapping method (USSL) 622
- ultraviolet germicidal irradiation (UVGI) 909
- uni-directional printing 486
- Uniclic locking mechanism 1545, 1704
- Uniclic locking system 1545
- Uniclic patented technology 1701
- unicolour printing 566–567
- uniform laminar flow 21
- Unilin's patents 15, 1702
- Unilin Technologies 1543, 1699
- digital printing 1704–1710
- intellectual property as business asset 1699–1700
- proactive licensing 1700–1701
- reactive licensing 1700, 1702
- sub-licensing program 1703–1704
- trade secrets 1709–1710
- Unique Selling Points (USP) 977, 1271
- United States Food and Drug Administration (US FDA) 436–437
- Universal Compensation Interface (UCI) 1336, 1345
- unstable flows 30
- unzipping 1122
- up-draw process 608, 619

- urea 108, 237, 853–855, 864
- urethane acrylate oligomers 171–172
- urethane methacrylate oligomers 173–174
- USB based oscilloscope 680
- US International Trade Commission (ITC) 1702
- USPTO (United States Patent and Trademark Office) 1674
- UV Absorber Tinuvin 405, 352
- UV bump and thermal curing 1091
- UV chemistry
 - advantages 911–912
 - disadvantages 912
- UV curable alkenyl monomers 125–183
 - acrylamide monomers 161
 - acrylate/alkene and methacrylate/alkene monomers 167
 - acrylate monomers 139–149
 - acrylate/vinyl ether and methacrylate/vinyl ether monomers 165–167
 - methacrylate monomers 149–155
 - N*-vinyl amide monomers 159–161
 - N*-vinyl amine monomers 161–162
 - vinyl carbonate monomers 164–165
 - vinyl ester monomers 162–164
 - vinyl ether monomers 155–159
- UV curable alkenyl monomers and oligomers
 - chemical structure and substitution pattern 128–129
 - double bond density and volume shrinkage 132–134
 - formulation viscosity and ink jettability 134–137
 - radical photopolymerization and radical stability 130–132
- UV curable alkenyl oligomers 126, 127
 - acrylate oligomers 168–173
 - methacrylate oligomers 173–174
- UV-curable ink 97, 99
 - rapid pinning technology for 1189–1190
 - selection of 1187–1188
- UV-curable inkjet inks
 - formulation 117
 - industrial applications 279–280
 - ink compounds and ink formulations 284–288
 - interior decoration 293–294
 - label printing 292–293
 - low-migration inkjet inks 294–300
 - marking and coding 291–292
 - packaging 293
 - product printing 292
 - production 288–289
 - requirements 282–284
 - UV curing process 280–282
- UV-curable liquid compositions 99
- UV-curable monomers 102
- UV curable polyurethane dispersions (UV-PUD) 252
- UV curing
 - equation 824–825
 - GMP 841
 - ink applications 835–836
 - legislation 837–839
 - low migration inks 837
 - migration and setoff reduction 834–835
 - migration substances 836
 - nonlinear polymerization 825–827
 - packaging systems 839–840
 - polymerization grade 828–829
 - power vs. exposure time 827–828
 - process 823–824
 - process development 829–834
 - qualification process 840
 - setoff 836–837
- UV-curing inks 1155, 1165
- UV curing of water-based formulations 252–257

- UV curing process 6, 99, 199, 202, 280–282, 284, 288, 769–774, 777–779, 792, 793, 795, 823–824, 931–932, 1025
- UV DirectCure
 - acrylate molecule as internal photoinitiator 954–957
 - vs. EB-curing
 - experimental 957–959
 - FTIR(ATR) spectra 958–961
 - industrial DirectCure unit 963–964
 - post-irradiated prints 961–962
 - SPME/GCMS measurements 959–961
 - UV technology 963
 - EB-or UV-cured inks and varnishes migration 951–953
- UV, electron beam 986–988
- UV inkjet inks
 - background and formulation basics 125
 - overview 5–7
- UV inks, composition 99
- UV lamp 1631–1632
 - arc lamp length 930–931
 - curing systems 927–928
 - high intensity reflector system 928, 929
 - integrated air-cooling 930
 - nitrogen inertion 931–932
 - quick change cassette 928, 930
 - rapid warm up and cool down 930
 - service life 930
- UV-LED curing 5, 211, 1004–1005
- UV LED technology 202
 - arrays 935
 - array size, number of diodes and emitting window width 941–943
 - base building block 934–935
 - benefits 943–944
 - cooling 935–936
 - curing 245–252
 - curing lamp systems 933
 - curing technology 933
 - dose 940–941
 - emission spectrum 938–939
 - markets and applications 945–946
 - material formulation 943
 - optical power specifications 939
 - optics 937
 - peak irradiance 939–940
 - pinning 947–948
 - power 940
 - stray light 948–949
 - thermal management and aerodynamics 948
- UV light
 - in Alpha tower 1456
 - arc lamps 915–917
 - ballast 921, 922
 - cooling system 923–924
 - curing products 911
 - electromagnetic spectrum 909, 910
 - excimer 917–918
 - lamp architecture 920–921
 - lasers 913, 914
 - LED 918–919
 - light shielding 924
 - microwave 914, 915
 - power and control cabling 926–927
 - reflectors 922–923
 - shutters 924–926
- UV-nanoimprint lithography 1382
- UV photoinitiators 5, 910–911
- UV pinning 11, 1103, 1136, 1259, 1264, 1266, 1280, 1283–1284, 1286, 1525
- UV radiation
 - Beer–Lambert law 779–780
 - doped medium pressure mercury lamps 775–776
 - electromagnetic spectrum 771–772 and energy 769–771
 - excimer lamps 776–778
 - filter radiometers 790–793
 - LED radiation sources 778–779
 - medium pressure mercury lamps 774–775
 - penetration depth 780–786
 - radiochromic films 787–790
 - radiometric data 795–797

- radiometric terminology 772–774
- spectral radiometers 793–795
- UV radical curing system 205
- V**
- vacuum system 874, 990, 1177–1178
- vacuum ultraviolet (VUV) 872, 968
- value chain and eco-footprint
 - printing directly on objects 1661–1665
 - printing on paper 1654–1658
 - printing on self-adhesive labels 1658–1661
- variable data printing (VDP) 95, 300, 946, 1069, 1503, 1506, 1587, 1588, 1591
- varnish, cured ink 316
- vat dye inks 340, 852
- vegetable oils 169
- vegetable/mineral oil emulsions 853
- VersaDrop 525, 526, 529, 530
- Versapass A4 suspended heater design 590–592
- VersaPass compact print engine 600
- VersaPass Waterfall Printing Technology® 585
- vibration test 395
- vibratory finishing medium 1459
- vinyl (poly(vinylchloride)) 328
- N*-vinyl amide monomers 159–161
- vinyl amides 286
- N*-vinyl amides 129, 160, 161, 183, 286
- N*-vinyl amine monomers 161–162
- N*-vinyl amines 129
- N*-vinylcaprolactam 159, 176, 183, 286, 328
- vinyl carbonate monomers 164–165
- vinyl carbonates 129, 164
- vinyl chloride/vinyl acetate copolymers 106
- vinyl ester monomers 162–164
- vinyl esters 129, 162, 286
- vinyl ether monomer 155–159, 163, 165–167, 286, 325
- N*-vinylformamide 159, 176
- N*-vinylimidazole 161, 162, 176
- N*-vinyl-5-methyl-2-oxazolidinone 183
- 2-(2-vinyloxyethoxy)ethyl acrylate (VEEA) 165, 166, 328
- 2-(2-vinyloxyethoxy)ethyl methacrylate 166
- N*-vinylpyrrolidone 159, 176, 183, 1370
- vinylsulphones 848
- vinylsulphones dyes 848
- viscoelastic behavior, of functional polymer inks 407, 408, 672, 673
- viscoelasticity 22, 347, 348, 658–663, 666, 667, 671, 681, 690, 691
- Viscolite 663
- viscosity 47, 134, 407
 - modifiers 107
 - range 72, 73, 284, 426, 560, 687, 1222, 1679
 - of silver ink 389–391
- volatile organic compounds (VOCs) 104, 288, 298, 340, 823, 842, 872, 883, 977, 1014, 1145, 1640, 1729
- voltage, of flash lamp systems 1053
- volume chemistry 883, 885
- volume shrinkage 132–134, 160, 173, 1407
- vortices 4, 24, 30, 34
- voxel resolution 1395
- W**
- wakes 4, 26–30, 36, 39
- Walther–Trowal AM3 1458
- washing liquid 304
- waste paper 449, 641
- waste stack 763
- water-based acrylic resin 455
- water-based ceramic inkjet ink
 - formulation 115, 118
- water-based ceramic inks 361–362
- water-based flexographic ink 455
- water-based ink(s) 48, 98, 105, 110, 637, 1187
 - formulation 96, 105, 115
- water-based inkjet inks 105, 125, 179, 180, 209, 287, 636, 1199, 1549–1550
- water-based UV photoinitiators 5

- water-compatible UV curable alkenyl monomers and oligomers 5, 174–181
 - water-cooled light sources 936, 941, 948
 - water-dispersible alkenyl oligomers 178–181
 - water-dissipatable polymer 100
 - water-insoluble dyes 100
 - water jet cleaning 1456
 - water-soluble acrylated derivatives 177
 - water-soluble alkenyl monomers 175–178
 - water soluble alkenyl oligomers 176–178
 - water soluble inkjet inks 456
 - water soluble monomers and oligomers 334
 - water transfer printing 1272, 1299
 - waveform, development 408, 1099
 - wavelength of light 698, 706, 714, 909
 - wax oil gels 1190–1192
 - Weber number (We) 5, 49–54, 110, 135, 394, 395, 407, 696, 1467, 1468
 - wet rub resistance test 1560
 - Wetflex' technology 329
 - wettability 96, 387, 396, 410, 412, 425, 612, 613, 616, 845, 868, 896, 1373
 - wetting 96, 396
 - agents 111, 127, 135, 180, 289, 854, 856
 - control 892–893
 - white ink 291, 299, 306, 315, 947, 1075, 1076, 1124, 1125, 1137
 - white UV ink 219, 287
 - Whitelines 757–759, 761, 763–766
 - wood grain, fundamental aspects 4
 - wood-graining effect 19–39, 528
 - workflow assessment 750–752
 - working electrode (WE) 1249
 - woven textile 846
- X**
- Xaar
 - advanced manufacturing 552–553
 - ceramic tile decoration 550–551
 - coding and marking 551
 - company history 535
 - core technology
 - Chevron actuator 540
 - acoustic firing of drops 540–541
 - piezoelectric shear mode actuation 537–538
 - shared wall actuator 538–540
 - digital embellishments 551
 - direct to shape/object printing 551–552
 - glass printing 551
 - label printing 551
 - Printhead Technology 535–536
 - printheads in ink jet market sectors 550
 - TF Technology* 542
 - air and debris removal from ink channels 542–544
 - heat removal from actuator 544
 - ink supply to nozzle 544–546
 - recirculation path 547–548
 - 3D printing 552
 - Xaar 1003 chevron side shooter actuator 541
 - Xaar 1003 chevron side shooter printhead channel array 539
 - Xaar Hydra ink 1322, 1326
 - Xaar 1003 printhead, robot arm 1321–1322
 - demonstration 1319–1320, 1324–1325
 - printhead orientation effect 1325–1328
 - printhead acceleration effect 1328–1332
 - jetting performance analysis 1323–1324
 - print system 1322
 - Xaar's High Laydown Technology 73, 545
 - Xaar's TF Technology® 541–542, 544, 550, 551, 553, 1322

Xaar technology 553, 569
xanthene 341
xenon excimer lamps 777, 965–969, 974
XYPrint machines 1115

y

yellowing effect 1407
Young–Fowkes equation 805
Young’s equation 396
Young’s modulus 609, 988, 1460

z

zero defect manufacturing (ZDM) 1288,
1291–1292, 1295
zero defect robot based inkjet printing
art manufacturing process and
workflow 1292, 1293
for robotic inkjet printing 1292
ZDM 1291–1292
zeta potential 103
Z Number 5, 49–52

