

Subject Index

A

Acceptor compensator, 313
 Admittance, metal oxide
 semiconductor (MOS),
 381
 Aging of silicon, 313
 AlGaAs qualification
 techniques, 628
 Aluminum etching, 250
 Amorphization, 108
 Amorphous silicon, 241
 Arsenic, 521
 ASTM Standards, 15
 F 121: 367
 F 123-83: 372
 F 523: 282
 F 723: 474
 Atomic
 distributions, 480
 profiling, 535
 Auger Electron Spectro-
 scopy, 119, 178, 628
 Autodoping, 21, 33
 Automated guided vehicles
 (AGVs), 653
 Automated production
 processes
 automatic resistivity
 tester (ART), 602
 computer-aided process
 optimization, 246
 computer-assisted manu-
 facturing (CAM), 653
 computer-integrated manu-
 facturing (CIM), 662
 equipment reliability,
 673
 material handling, 653
 particle and material
 control system, 414
 wafer fabrication
 automation, 653
 Automatic resistivity
 tester (ART), 602

B

Backscatter, Rutherford,
 119, 688
 Backsurface damage, 324
 Barrel reactor, 79

Beryllium implants, 628
 Bonding structure, 173
 Boron, 204, 521, 573
 BPSG, 615
 Buried layers, 21

C

C_2ClF_5 , 204
 Carbon, in silicon, 365,
 683
 Carrier distributions, 480,
 502, 558
 Channel mobility, 21
 Charged particle activation
 analysis, 365
 Chemical vapor deposition
 (CVD)
 bonding structure, 173
 cold wall, 35
 low pressure, 173
 low temperature, 24, 43
 plasma enhanced, 21, 173
 reactor design, 129
 thin epitaxial silicon
 deposition, 33
 uniformity, 129
 Chlorinated gases, 204
 Clean room technology, 414,
 423
 CMOS technology
 epitaxial quality, 51
 silicon epitaxial growth
 on N+ substrate, 65
 Comprehensive uptime, 673
 Computer-aided process
 optimization, 246
 Computer-assisted manu-
 facturing (CAM), 653
 Computer-integrated manu-
 facturing (CIM), 662
 Conductivity, 480
 Contamination
 carbon, 365
 control, 336, 414, 423
 hydrogen, 313
 measurement, 119, 365
 oxygen, 365
 process gases, 436
 reactive ion etching
 damage, 163
 Conversion coefficient, 365

Correction factors, 480,
502
CV, electrochemical, 558

D

Damage
 backsurface, 324
 control, 163
 displacement, 535
 from reactive ion
 etching, 163
 ingot-to-wafer
 processing, 297
 plasma, 220
 radiation, 381
Dedicated processing, 662
Defects, 281, 336, 381
Deposition uniformity, 129
Depth profiling, 453, 521
Design rules, 404
Device sensitivity, 393
Diameter scans, 598
Dielectrics, 137, 173, 220,
336
Diffusion, doped oxide
 spin-on source, 95
Displacement damage, 535
Distributed software
 functions and system
 architecture, 662
Doping and dopants
 autodoping, 21
 carrier distributions,
 480, 502, 558
 cross-contamination, 119
 implant, 204
 profiling (See Profile
 control and analysis)
 spreading resistance (See
 Spreading resistance
 measurements)

E

Edge profile, 204
Education for the elec-
 tronics industry, 691
Electrochemical CV, 558
Emission endpoint, plasma
 etch, 190
Epitaxial films
 growth on N⁺ substrate,
 65, 79
 layers, 586, 598

quality, 51
silicon, 79, 281
surface defects, 281

Epitaxy

chemical vapor deposition
 (CVD), 33
HCL etching, 79
layers, 586
low-temperature
 deposition, 24
molecular beam, 558
plasma-enhanced CVD, 21
quality, 51
silicon-on-sapphire, 33
surface defects, 281

Equipment-dependent uptime,
673

Error propagation, 393

ESCA analysis, 313

Etching

aluminum, 250
anisotropy, 79
high-temperature vapor,
79
in situ HCl, 79
metal dry, 250
palladium, 273
plasma, 220
plasma etch emission
 endpoint, 190
rate, 79
reactive ion, 220, 250
uniformity, 190

Exposure ambient, 257

F

Fabrication automation (See
 Automated production
 processes)

Factory communications, 653

Films (See also Epitaxial
 films)

palladium, 266
silicon dielectric, 173
silicon dioxide
 breakdown, 336

Filtration, 436

Finite element method, 480

Fluorinated gases, 204

Four-point probe, 586

Fourier transform infrared
 spectroscopy (FT-IR),
353

Fracture, ingot, 297

Free carrier absorption,
353
Freon 115, 204

G

Gallium arsenide, 220, 628,
643
Gases, process, 436
Gettering
 effects on epitaxial
 quality, 51
 impurities, 324, 336
 internal, 8, 65
 intrinsic, 51, 353, 686
Global environment, 662

H

Haze, 79, 313
HCl etching, 79
Hydrogen analysis, 313

I

Implantation, 453
 beryllium, 628
 cross-contamination
 levels produced, 119
 knock-on, 535
 profile control of
 plasma-etched
 polysilicon, 204
Infrared absorption
 spectroscopy, 353,
 628, 684
Ingot processing damage,
 297
Insulators, 137
Integration, system, 662
Interface defects, 381
Interstitial oxygen
 measurements, 353
Ion beam implantation, 453
 cross-contamination
 levels produced, 119
 damage, 150
 into same-conductivity-
 type substrates, 586
 into 200-mm wafers, 598
 knock-on, 535
 low-dose, 586
 nitridation, 150

J

Junction
 breakdown voltage, 51
 depth, 573
Junction formation
 techniques, 95, 266
Just-in-time material
 delivery, 653

K

Knock-on, 535

L

Laplace's equation, 480
Laser ionization mass
 analysis (LIMA), 324
Laser scanning, 281
Latch-up, 51
Lithography, X-ray, 257
Loading effect, 190
Logistic time, 673
Low-pressure deposition, 21
Low-temperature deposition,
 21, 24

M

Manufacturing (See also
 Automated production
 processes)
 computer-assisted manu-
 facturing (CAM), 653
 computer-integrated manu-
 facturing (CIM), 662
 equipment reliability,
 673
 mechanical processing,
 297
 particle and material
 control, 414, 423
 standards, 15
 variability, 393
 wafer fabrication
 automation, 653
Maps, three-dimensional
 (contour), 598
Materials (See also Gallium
 arsenide; Silicon)
 contamination
 measurements, 119

Materials (Continued)
 control, 414
 defects, 54, 65, 281
 Mean time between assists
 (MTBA), 673
 Mean time between failures
 (MTBF), 673
 Mean time to assist (MTTA),
 673
 Mean time to repair (MTTR),
 673
 Mechanical processing, 297
 Metal oxide semiconductor
 (MOS) devices, 150,
 336, 381
 Microdefects, 65
 Mobility, 150
 Modeling
 process, 573
 yield, 404
 Molecular beam epitaxy, 558
 Monte Carlo method, 190,
 535

O

Optical analysis
 techniques, 628
 Optically activated states,
 381
 Oxide layer analysis, 615
 Oxygen, in silicon, 353,
 365, 683

P

Palladium silicide-silicon
 contacts, 266
 Parametric variability, 393
 Pareto analysis, 393
 Particulate control, 414,
 423, 436
 Phosphorus, 204
 Photoconductivity,
 transient, 241
 Photoluminescence
 quenching, 628
 Photoresists, 250
 Plasma technology
 deposition of amorphous
 silicon, 241
 etch emission endpoint,
 190
 etching, 190, 220, 423
 plasma damage, 220

plasma-enhanced chemical
 vapor deposition, 21,
 173
 processes, table, 223
 processing of dielectric
 layers, 220
 profile control of
 etching, 204
 quality control during
 plasma deposition,
 241
 reactive ion etching
 (RIE), 163, 220, 250
 Poisson's equation, 480
 Polysilicon, 204
 Precipitation effects,
 oxygen and carbon in
 silicon, 683
 Process simulation, 404,
 573
 Processing
 dedicated, 662
 mechanical, 297
 Production processes,
 automated, 241
 Productive time, 673
 Profile control and
 analysis
 dopant, 95, 573, 687
 electrochemical CV, 558
 impurity profiles, 521
 of plasma-etched
 polysilicon, 204
 primary kinematic knock-
 on in SIMS, 535
 sampling volume cor-
 rection factors, 502
 spreading resistance,
 453, 480, 558
 PSG deposition, 204, 615

Q

Quality control
 during plasma deposition,
 241
 using laser scanning, 281
 Quenching, photo-
 luminescence, 628

R

Radiation
 damage, 381
 deep ultraviolet, 250

Reactive ion etching
 damage, 163
 on gallium arsenide ICs,
 220
 UV radiation, effects of,
 250
 Reactor design and
 productivity, 129
 Real-time shop floor
 control, 653
 Recoil implantation, 535
 Reduced pressure, 33
 Reliability of
 manufacturing
 equipment, 673
 Resistance
 sheet, 95, 598
 spreading (See Spreading
 resistance
 measurements)
 Resistivity mapping, 586,
 598
 Rutherford Backscattering
 Spectroscopy, 119,
 688

S

Sampling volume correction
 factors, 502
 Berkowitz-Lux algorithm,
 510
 Local slope technique,
 508
 PROF algorithm, 510
 Schumann-Gardner Theory,
 505
 Scans, diameter, 598
 Scheduled time, 673
 Secondary ion mass spectro-
 metry (SIMS), 521,
 535, 573, 687
 Semiconductor Equipment and
 Materials Institute
 (SEMI) Standards, 16
 Semiconductors
 business forecasts, 7
 equations, 480
 free carrier absorption,
 353
 interstitial oxygen
 measurements, 353
 materials
 gallium arsenide, 220,
 628, 643
 silicon (See Silicon)
 silicon-on-sapphire, 33
 standards (See Standards)
 yield enhancement, 404,
 423
 Sensitivity, device, 393
 SF₆, 204
 Sheet resistivity, 95, 598,
 688
 Shot noise, 257
 Silicon
 aging, 313
 amorphous, 241
 carbon contamination,
 365, 683
 contamination control,
 336
 damage, 297
 defects, 281, 336, 381
 dielectrics, 173
 dioxide, 336, 381
 doped oxide source
 diffusion, 95
 electrochemical CV, 558
 epitaxy
 chemical vapor
 deposition (CVD), 33
 HCL etching, 79
 layers, 586
 low-temperature
 deposition, 24
 molecular beam, 558
 plasma-enhanced CVD, 21
 quality, 51
 silicon-on-sapphire, 33
 surface defects, 281
 gettered impurities, 324
 haze generation, 313
 hydrogen contamination,
 313
 impurity profiling and
 measurement, 119,
 365, 521
 infrared absorption, 353,
 684
 local oxidation of, 150
 mapping, 586
 moisture effects on, 313
 n-type, 353
 oxygen contamination,
 365, 683
 oxynitride, 173
 p-type, 353
 process control, 586
 profile control of
 etching, 204

- Silicon (Continued)
 - reactive ion etching
 - damage, 163
 - spreading resistance (See Spreading resistance measurements)
 - X-ray fluorescence
 - analysis, 615
 - SF₆, 204
 - Silicon-oxide interface, 381
 - Software functions,
 - distributed, 662
 - Solar cells, 297
 - Source diffusion, doped
 - oxide spin-on, 95
 - Spreading resistance
 - measurements
 - boron profile analysis, 573
 - carrier density
 - calculations, 480
 - comparison with
 - electrochemical CV, 558
 - comparison with four-point-probe
 - measurements, 586
 - comparison with secondary
 - ion mass
 - spectrometry, 521
 - correction factors, 480, 502
 - incremental sheet
 - resistance, 688
 - multilayer Laplace equation analysis, 480
 - overview, 453
 - shallow xenon
 - implantation, 108
 - Sputtering, 137, 535
 - Standard mechanical
 - interface (SMIF), 414
 - Standards
 - applications, 15
 - ASTM F 121: 367
 - ASTM F 123-83: 372
 - ASTM F 523: 282
 - ASTM F 723: 474
 - development organiza-
 - tions, 15
 - international cooperation
 - in, 15
 - Standby time, 673
 - Statistical modeling, 393
 - SUPREM computer modeling
 - program, 526, 573, 689
 - Surface
 - analysis techniques, 628
 - cleaning, 24, 288
 - defects, 281
 - roughness, 150
 - System
 - architecture,
 - distributed, 662
 - integration, 662
 - moments, generation of, 393
- T
- Thin films, 137
 - Transient photo-
 - conductivity, 241
 - Transistors, MOS, 150, 336, 381
 - Transition width, 33
 - Trend analysis, 598
 - TRIM Monte Carlo code, 538
- U
- Ultraviolet radiation, 250
 - Undercut, 204
 - Uniformity of plasma etch, 190
 - Unscheduled time, 673
 - Uptime
 - comprehensive, 673
 - equipment dependent, 673
- V
- Variability, parametric, 393
 - Vertical reactor, 33
 - VLSI (very large scale
 - integration) (See also Wafers)
 - contacts, 266
 - gases, particulate
 - control in, 436
 - processing, 8, 266, 414

W

Wafers

- cracks, 297
- inspection, 281
- large diameter, 598
- processing, 598
- thin-layer analysis by X-ray fluorescence, 615
- uniformity, 598
- zone engineering, 8

X

X-ray

- fluorescence analysis, 615
- lithography, 257
- resist, 257
- Xenon ionic implantation, 108

Y

Yield analysis and

- enhancement, 404, 423