

- Part I Overview and Materials
- Chapter 1 An Introduction to Microelectronic Fabrication
 - 1.1 Microelectronic Technologies: A Simple Example
 - 1.2 Unit Processes and Technologies
 - 1.3 A Roadmap for the Course
 - 1.4 Summary
- Chapter 2 Semiconductor Substrates
 - 2.1 Phase Diagrams and Solid Solubility
 - 2.2 Crystallography and Crystal Structure
 - 2.3 Crystal Defects
 - 2.4 Czochralski Growth
 - 2.5 Bridgman Growth of GaAs
 - 2.6 Float Zone Growth
 - 2.7 Water Preparation and Specifications
 - 2.8 Summary and Future TrendsProblemsReferences
- Part II Unit Process I: Hot Processing and Ion Implantation
- Chapter 3 Diffusion
 - 3.1 Fick's Diffusion Equation in One Dimension
 - 3.2 Atomistic Models of Diffusion
 - 3.3 Analytic Solutions of Fick's Law
 - 3.4 Corrections to Simple Theory
 - 3.5 Diffusion Coefficients for Common Dopants
 - 3.6 Analysis of Diffused Profiles
 - 3.7 Diffusion in SiO₂
 - 3.8 Diffusion Systems
 - 3.9 SUPREM Simulations of Diffusion Profiles
 - 3.10 SummaryProblemsReferences
- Chapter 4 Thermal Oxidation
 - 4.1 The Deal-Grove Model of Oxidation
 - 4.2 The Linear and Parabolic Rate Coefficients
 - 4.3 The Initial Oxidation Regime
 - 4.4 The Structure of SiO₂
 - 4.5 Oxide Characterization
 - 4.6 The Effects of Dopants During Oxidation and Polysilicon Oxidation
 - 4.7 Oxidation-Induced Stacking Faults
 - 4.8 Alternative Gate Insulators
 - 4.9 Oxidation Systems
 - 4.10 SUPREM Oxidations
 - 4.11 SummaryProblemsReferences
- Chapter 5 Ion Implantation
 - 5.1 Idealized Ion Implantation Systems
 - 5.2 Coulomb Scattering
 - 5.3 Vertical Projected Range
 - 5.4 Channeling and Lateral Projected Range
 - 5.5 Implantation Damage
 - 5.6 Shallow Junction Formation

- 5.7 Buried Dielectrics
- 5.8 Ion Implantation Systems: Problems and Concerns
- 5.9 Implanted Profiles Using SUPREM
- 5.10 SummaryProblemsReferences
- Chapter 6 Rapid Thermal Processing
- 6.1 Gray Body Radiation, Heat Exchange, and Optical Absorption
- 6.2 High-Intensity Optical Sources and Chamber Design
- 6.3 Temperature Measurement
- 6.4 Thermoplastic Stress
- 6.5 Rapid Thermal Activation of Impurities
- 6.6 Rapid Thermal Processing of Dielectrics
- 6.7 Silicidation and Contact Formation
- 6.8 Alternative Rapid Thermal Processing Systems
- 6.9 SummaryProblemsReferences
- Part III Unit Processes 2: Pattern Transfer
- Chapter 7 Optical Lithography
- 7.1 Lithography Overview
- 7.2 Diffraction
- 7.3 The Modulation Transfer Function and Optical Exposures
- 7.4 Source Systems and Spatial Coherence
- 7.5 Contact/Proximity Printers
- 7.6 Projection Printers
- 7.7 Advanced Mask Concepts
- 7.8 Surface Reflections and Standing Waves
- 7.9 Alignment
- 7.10 SummaryProblemsReferences
- Chapter 8 Photoresists
- 8.1 Photoresist Types
- 8.2 Organic Materials and Polymers
- 8.3 Typical Reactions of DQN Positive Photoresist
- 8.4 Contrast Curves
- 8.5 The Critical Modulation Transfer Function
- 8.6 Applying and Developing Photoresist
- 8.7 Second-Order Exposure Effects
- 8.8 Advanced Photoresists and Photoresist Processes
- 8.9 SummaryProblemsReferences
- Chapter 9 Nonoptical Lithographic Techniques
- 9.1 Interactions of High-Energy Beams with Matter
- 9.2 Direct Write Electron Beam Lithography Systems
- 9.3 Direct Write Electron Beam Lithography Summary and Outlook
- 9.4 X-Ray Sources
- 9.5 Proximity X-Ray Exposure Systems
- 9.6 Membrane Masks
- 9.7 Projection X-Ray Lithography
- 9.8 Projection Electron-Beam Lithography (SCALPEL)
- 9.9 E-Beam and X-Ray Resists

- 9.10 Radiation Damage in MOS Devices
- 9.11 SummaryProblemsReferences
- Chapter 10 Vacuum Science and Plasmas
- 10.1 The Kinetic Theory of Gasses
- 10.2 Gas Flow and Conductance
- 10.3 Pressure Ranges and Vacuum Pumps
- 10.4 Vacuum Seals and Pressure Measurement
- 10.5 The DC Glow Discharge
- 10.6 RF Discharges
- 10.7 High-Density Plasmas
- 10.8 SummaryProblemsReferences
- Chapter 11 Etching
- 11.1 Wet Etching
- 11.2 Chemical Mechanical Polishing
- 11.3 Basic Regimes of Plasma Etching
- 11.4 High-Pressure Plasma Etching
- 11.5 Ion Milling
- 11.6 Reactive Ion Etching
- 11.7 Damage in Reative Ion Etching
- 11.8 High-Density Plasma (HDP) Etching
- 11.9 Liftoff
- 11.10 SummaryProblemsReferences
- Part IV Unit Processes 3: Thin Films
- Chapter 12 Physical Deposition: Evaporation and Sputterin