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4.4 Conclusions and Remarks; Acknowledgments; List of Symbols; References; Part 2: Particle Removal Techniques; Chapter 5: High Intensity Ultrasonic Cleaning for Particle Removal; 5.1 Introduction 5.2 Ultrasound and Ultrasonics 5.3 Cavitation Phenomenon; 5.4 Generation of Ultrasound - Transducers; 5.5 Ultrasonic Generators; 5.6 Principles of Ultrasonic Cleaning for Particle Removal; 5.7 Determination of Residual Particles on Surfaces; 5.8 Ultrasonic Aqueous Cleaning Equipment and Process; 5.9 Precision Cleaning; 5.10 Contaminants; 5.11 Ultrasonic Cavitation Forces and Surface Cleaning; 5.12 Cleaning Chemistry; 5.13 Mechanism of Cleaning; 5.14 Cavitation Erosion; 5.15 Summary; References; Chapter 6: Megasonic Cleaning for Particle Removal; 6.1 Introduction 6.2 Principles of Megasonic Cleaning 6.3 Particle Removal Mechanisms During Megasonic Cleaning; 6.4 Types of Megasonic Systems; 6.5 Particle Removal and Feature Damage in Megasonic Cleaning; 6.6 Summary; References; Chapter 7: High Speed Air Jet Removal of Particles from Solid Surfaces; 7.1 Introduction; 7.2 Fundamental Characteristics of the Air Jet; 7.3 Fundamentals of Air Jet Particle Removal; 7.4 New Methods Using Air Jet; 7.5 Summary and Prospect; List of Symbols; References; Chapter 8: Droplet Spray Technique for Particle Removal; 8.1 Introduction; 8.2 Droplet Impact Phenomena 8.3 Cleaning Process Window 8.4 Droplet Spray Technique for Semiconductor Wafer Cleaning; 8.5 Summary; References; Chapter 9: Laser-Induced High-Pressure Micro-Spray Process for Nanoscale Particle Removal; 9.1 Introduction; 9.2 Concept of Droplet Opto-Hydrodynamic Cleaning (DOC); 9.3 Micro-Spray Generation by LIB; 9.4 Mechanisms of Particle Removal by Laser-Induced Spray Jet; 9.5 Generation of Micro-Spray Jet; 9.6 Nanoscale Particle Removal; References; 9.7 Summary; Chapter 10: Wiper-Based Cleaning of Particles from Surfaces; 10.1 Introduction 10.2 Basic Mechanism of Wiping for Cleaning of Particles and Other Contaminants

Sommario/riassunto

The book provides a comprehensive and easily accessible reference source covering all important aspects of particle adhesion and removal. The core objective is to cover both fundamental and applied aspects of particle adhesion and removal with emphasis on recent developments. Among the topics to be covered include: 1. Fundamentals of surface forces in particle adhesion and removal. 2. Mechanisms of particle adhesion and removal. 3. Experimental methods (e.g. AFM, SFA, SFM, IFM, etc.) to understand particle-particle and particle-substrate interactions. 4. Mechanics of adhesion of micro- and n
