Contents

Organizing and Steering Committee V
List of Contributors VII
Preface XXIII
Opening Address XXV

- I. Photo- and Radiation Physics and Chemistry of Polymers, Resist Materials and Processes for Microelectronics
 - 1 Recent Progress in Organic Resist Materials (C. G. Willson et al.) 3
 - 2 Non-Uniform Reactivity of Reactions in Polymer Solids (I. Mita) 19
 - 3 Mechanistic Aspects of Positive Novolak Resists (J.-P. Huang et al.) 33
 - 4 Radiation Chemistry of Polymers with Simultaneous Scission and Depropagation (R.W. Garrett et al.) 47
- 5 Radiation Chemistry of Resists and Polymer Films Studied by Picosecond and Nanosecond Pulse Radiolysis (S. Tagawa) 63
- 6 Mechanism of Radiation-Induced Degradation of PMMA as Studied by ESR and Electron Spin Echo Methods (H. Yoshida and T. Ichikawa) 83
- 7 UV and X-Ray Sensitive Polyurethanes Containing Pyrimidine Photodimers (Y. Inaki et al.) 91
- 8 Photo-Initiated Introduction of Amino Groups and Image Formation in Thin Polymer Films (M. Tsunooka and M. Tanaka) 103
- 9 Studies of Ultraviolet and Electron-Beam Chemistry in Ketone Polymers(S. A. M. Hesp and J. E. Guillet) 113
- 10 Radiation Chemistry of Polymers Containing Heteroatoms (H. Yamaoka) 131
- 11 Pulse Radiolysis Study on Formation of Poly(Phenylacetylene) Ions in Solution (H. Yamaoka et al.) 143

XVIII Contents

- 12 Photosensitive Polymers with Pendant Imino Sulfonate Groups (M. Shirai et al.) 149
- 13 Laser Photodecomposition of Polymer Films: Changes of Molecular Weight of Polymethyl Methacrylates (PMMA) by CO₂ Laser Irradiation (T. Ishii et al.) 157
- 14 Ultrathin Polymer Films for Electron Beam Nanolithography (S.W. J. Kuan et al.) 169
- 15 Laser-Responsive Polymers for Microelectronic Applications (C. Decker) 187
- 16 Polymer Surfaces: Their Role in High Resolution Imaging (G. N. Taylor et al.) 203
- 17 Surface Imaging for Half-Micron Lithography (B. Roland) 219
- 18 Wet and Dry Developable Photoresist Systems for Half- and Subhalf-Micron Optical Lithography (F. Vollenbroek et al.) 233
- 19 Patterned Polymerization of Styrene by SR-CVD (T. Hayakawa et al.) 245
- 20 Recent Progresss in Excimer Laser Lithography (M. Nakase et al.) 255
- 21 Chemical Modification of PMIPK Resist (K.-D. Ahn) 269
- 22 Novel KrF Excimer Laser Resist, SLEX (T. Ito et al.) 283
- 23 New Two-Component-Type Silicone Resists Based on Alkali-Soluble Silsesquioxane Oligomer (H. Ban and A. Tanaka) 295
- 24 A Novel Silicon-Containing Resist for Half-Micron Photolithography(T. Noguchi et al.) 305
- 25 Application of Chrysotile-Derived Polymer to By-Layer EB Resist(Y. Yamashita and M. Kaziwara) 317
- 26 A Highly Sensitive Positive Electron Beam Resist EBR-9 HS31(M. Kataoka and A. Tokunaga) 327
- 27 The Mechanism of Reaction in the Development-Free Vapor Photolithography (X.-Y. Hong et al.) 343
- 28 Design Concept for Thermally Resistant Positive Photoresist (M. Hanabata et al.) 353
- 29 Novel Structures of Novolak Resins Designed to Improve Resist Alkaline Dissolution, Resolution, Thermal Resistance and Ease of Manufacturing (M.A. Toukhy and B.T. Beauchemin, Jr.) 363
- 30 1,3-Dioxin-4-Ones as New Sensitizers for Excimer Laser Lithography (Y. Onishi et al.) 375
- 31 Chemical Amplification in Resist Design: Acid-Catalyzed Deesterification (H. Ito and M. Ueda) 383
- 32 Chemistry and Processes for Deep UV Lithography: Materials for Chemically Amplified Resists (E. Reichmanis et al.) 397

- 33 Chemical Amplification Positive Resist Systems Using Novel Sulfonates as Acid Generators (T. Ueno et al.) 413
- 34 Success in Deep-UV Photoresists (R. Schwalm et al.) 425
- 35 Electron Transfer Mechanism for Photocatalyst Generation in Some Chemically-Amplified Resists (G. S. Calabrese et al.) 435
- 36 Highly Sensitive X-Ray and Electron-Beam Resists Using Chemical Amplification (J. Lingnau et al.) 445

II. New Photosensitive Polymers and PHB for Optical Memory and Related Applications

- 37 Persistent Spectral Hole-Burning: Photon-Gating and Fundamental Statistical Limits (W. E. Moener) 465
- 38 Single Photon Persistent Spectral Holes in Polymers and Glasses with Mesoscopic Structures (T. Tani) 481
- 39 Effect of Polymer Matrices on Thermal Broadening of PHB Holes Above 30K (T. Nishi et al.) 497
- 40 Spectral Hole-Burning and Holographic Image Storage in Polymer Films (Urs. P. Wild et al.) 507
- 41 Matrix Effect in Photochemical Hole Burning (K. Horie et al.) 519
- 42 Photochromic Liquid Crystal Polymers (V. Krongrauz) 529
- 43 Photochromism of Aromatic Molecules Dispersed in Polymer Solids Through Two Photon Ionization (A. Tsuchida et al.) 541
- 44 Novel Polymers in Data Storage Technology (G. Kaempf et al.) 549
- 45 Recording Characteristics of Cyanine Dye/Polymer Systems (N. Matsuzawa et al.) 567
- 46 Some Application of Solid Solutions of Spiropyrans in Polymers and in Bilayers for Information Storage (M. Kryszewski and P. Uznanski) 575
- 47 Organic Thin Films for Electroluminescence Displays (T. Tsutsui and S. Saito) 591

III. Polyimides and Related Functional Polymers for Electronics

- 48 Planarity of High Solid Type Polyimide (Shun-ichiro Uchimura et al.) 603
- 49 Planarization of Topographic Substrates by New Polysilphenylenesiloxane Resin for Fabricating Advanced Microelectronic Devices (A. Oikawa et al.) 617
- 50 Stress and Dielectric Characterization of Thermosets for Microelectronics Interconnection and Encapsulation (R.W. Biernath and D.S. Soane) 625
- 51 Studies of the Mechanical Properties and Adhesion of Polyimide Films (S. D. Senturia) 637
- 52 The Relationship Between Visco-Elasticity of Polyimide and Adhesion to Molding Compound (M. Tomikawa et al.) 655
- 53 Adhesion of Aluminum Film to CF₄ Plasma Treated Polyimides (Y. Momose et al.) 665
- 54 Polyimides for Electronics: Some Recent Developments (E. L. Yuan) 677
- 55 Required Changes in Polyimides for Microelectronics (S. Numata) 689
- 56 Polyimide of High Purification for Microelectronics (G. Matvelashvili et al.) 699
- 57 Electrical Properties of Polyimides for VLSI Interlevel Isolation(A. Dubey and D. L. Lile) 711
- 58 Molecular Structure and Properties of Aromatic Polyimides (M. I. Bessonov) 721
- 59 Preparation and Microelectronic Applications of Langmuir-Blodgett Films of Polyimides and Related Polymers (Y. Imai et al.) 735
- 60 Electrical Properties of Polyimide Langmuir-Blodgett Films Deposited on Noble Metal Electrodes (M. Iwamoto et al.) 749
- 61 Negative Resistance and Electron Emission in Metal/Langmuir-Blodgett Film/Metal Structures (K. Takimoto et al.) 761
- 62 Molecularly Oriented Polyimide Ultra-Thin Film Prepared by the Water Surface Spreading Method (N. Masutani et al.) 769
- 63 Miscibility of Polyimide/Polyimide Blends and Charge-Transfer Fluorescence Spectra (M. Hasegawa et al.) 781
- 64 Photopatternable Organic Dielectrics: Polybenzoxazoles versus Polyimides
 (R. Rubner et al.) 789
- 65 Preparation and Properties of Disilane-Containing Photodegradable Aromatic Polyamides and Polyimides from Bis(4-Aminophenyl)-Tetramethyldisilane (M. Padmanaban et al.) 811

- 66 Preparation and Properties of a Photosensitive Polyimide Having Low Thermal Expansion and Stress (A. E. Nader et al.) 823
- 67 Photocrosslinking Reaction of Benzophenone Type Polyimide and its Derivatives (T. Yamashita et al.) 837

Index 845