

Table of Contents

Preface

Chapter 1: Growth, Structure and Property of Wide Bandgap Semiconductors

Effect of Growth Chamber Structure on the Growth of Aluminum Nitride Crystals Z.Q. Lu, Y.P. Qu, M.I. Niass, M.N. Sharif, Y.H. Liu and F. Wang	3
Investigation of the 6-Folded Pattern in the Facetted Region of 4° Off-Axis 4H-SiC F. Fen, Y.M. Wang and R.S. Wei	9
Effects of Annealing Parameters on Epitaxial Graphene on SiC Substrates Y. Wang, Y. Li, Z.F. Zhao, P. Zhou, Z.J. Yin and Z.H. Li	14
Influence of the Etching Process on the Surface Morphology of 4H-SiC Substrate Used in the Epitaxial Graphene Z.F. Zhao, Y. Li, Y. Wang, P. Zhou, W. Yun and Z.H. Li	21
Theoretical Calculation and Simulation for Microcantilevers Based on SiC Epitaxial Layers X.F. Liu, G.G. Yan, Z.W. Shen, Z.X. Wen, J. Chen, Y.W. He, W.S. Zhao, L. Wang, M. Guan, F. Zhang, G.S. Sun and Y.P. Zeng	26
Homoepitaxial Growth on Si-Face (0001) On-Axis 4H-SiC Substrates G.G. Yan, X.F. Liu, F. Zhang, Z.W. Shen, W.S. Zhao, L. Wang, Y.X. Cui, J.T. Li and G.S. Sun	31
Progress in Single Crystal Growth of Wide Bandgap Semiconductor SiC C.J. Liu, T.H. Peng, B. Wang, Y. Guo, Y.F. Lou, N. Zhao, W.J. Wang and X.L. Chen	35
Study on Carbon Particle Inclusions during 4H-SiC Growth by Using Physical Vapor Transport System Z.Z. Wang, Z.L. Wu, M.M. Ge, H.Q. Bao, Z.F. Ma and J. Wu	46
Electron Mobility due to Surface Roughness Scattering in Depleted GaAs Free-Standing Thin Ribbon X.D. Hu, C.M. Li and S.Y. Yang	51
Measurement of Resistivity of Silicon Carbide by Discharge Time of Equivalent Capacitance of the Sample X. Wang, L. Tian, J.S. Li and S.J. Wang	60
Study of the Growth Temperature Measurement and Control for Silicon Carbide Sublimation F. Qu, H. Zhang, M. Han, H. Li, F.Z. Ding and H.W. Gu	65
Phase Control of Ga₂O₃ Thin Films Grown by Metal-Organic Chemical Vapor Deposition Z.Q. Li, Z.M. Chen, W.Q. Chen and G. Wang	72
Microstructure of Interfacial Basal Plane Dislocations in 4H-SiC Epilayers Z. Li, X. Zhang, Z.H. Zhang, L.G. Zhang, T. Ju and B.S. Zhang	77

Chapter 2: Fabrication, Property and Application of Wide Bandgap Semiconductor Devices

Design, Fabrication and Characterization of a 4.5kV / 50A 4H-SiC PiN Rectifiers Y.W. Liu, R.X. Yang and X. Deng	85
Recent Progress of SiC MOSFET Devices N. Iwamuro	90
Improved Electrical Properties of 4H-SiC MOS Devices with High Temperature Thermal Oxidation H.Y. Xu, C.P. Wan and J.P. Ao	99
The Correlation between the Reduction of Interface State Density at the SiO₂/SiC Interface and the NO Post-Oxide-Annealing Conditions H.Y. Xu, C.P. Wan and J.P. Ao	104
Reliability of 4H-SiC (0001) MOS Gate Oxide by NO Post-Oxide-Annealing H.Y. Xu, C.P. Wan and J.P. Ao	109

Low Defect Thick Homoepitaxial Layers Grown on 4H-SiC Wafers for 6500 V JBS Devices Y.X. Niu, X.Y. Tang, L.X. Tian, L. Zheng, W.T. Zhang, J.C. Hu, L.Y. Kong, X.H. Zhang, R.X. Jia, F. Yang and Y.M. Zhang	114
Effect of Grinding-Induced Stress on Interface State Density of SiC/SiO₂ S.H. Wang, C.P. Wan, H.Y. Xu and J.P. Ao	121
GaN Schottky Barrier Diodes with TiN Electrode for Microwave Power Transmission T.F. Pu, X.B. Li, X. Wang, Y.Y. Bu, L.A. Li and J.P. Ao	126
Research on Threshold Voltage Instability in SiC MOSFET Devices with Precision Measurement A. Liu, S. Bai, R.H. Huang, T.T. Yang and H. Liu	133
Simulation of Electrothermal Characteristics of 1200V/75A 4H-SiC JBS H. Gu, Y.D. Tang, L. Ge, Y. Bai, Y.R. Zhang, Y.F. Luo, X.Y. Liu, G. Song and B. Tan	139
The Influence of Temperature Storage on Threshold Voltage Stability for SiC VDMOSFET Z.Q. Bai, X.Y. Tang, C. Han, Y.J. He, Q.W. Song, Y.F. Jia, Y.M. Zhang and Y.M. Zhang	144
An Improved 4H-SiC Trench Gate MOSFETs Structure with Low On-Resistance and Reduced Gate Charge K. Tian, J.H. Xia, J.W. Qi, S.H. Ma, F. Yang and A. Zhang	151
An Optimized p⁺ Shielding 4H-SiC Trench Gate MOSFETs Structure with Floating Regions K. Tian, J.H. Xia, J.W. Qi, S.H. Ma, F. Yang and A. Zhang	157
Simplified Silicon Carbide MOSFET Model Based on Neural Network Y.H. Lee, M. Zhang, P.J. Niu, P.F. Ning, L. Liu and S.S. Lee	163
The Effect of Circuit Parameters on Reverse Biased Safe Operating Area of SiC MOSFET M.T. Cui, J.Y. Li, X.L. Yang and Y.J. Du	170
Effect of Tunneling on Small Signal Characteristics of IMPATT Diodes with SiC Heteropolytype Structures M.C. He, L.X. Hu, J.D. Zheng, W.S. Wei, H.L. Xiao, J.Z. Ye and G.J. Qiao	176
Simulation on Large Signal and Noise Properties of (n)Si/(p)SiC Heterostructural IMPATT Diodes J.D. Zheng, W.S. Wei, J.Z. Ye, W.B. Yang, C. Li and G.J. Qiao	182
Research on Performance Contrast between SiC MOSFET and Si IGBT Based on the Converter of Urban Rail Vehicles W.J. Li, D.Y. Meng, Y.J. Chang, C. Yang, Y. Lv and L.J. Diao	188
Comparison of High Voltage SiC MOSFET and Si IGBT Power Module Thermal Performance Y.J. Du, J.Y. Li, P. Wang and M.T. Cui	194
Thermo-Mechanical Reliability of 1200V-450A IGBT Module Considering Voids in the Solder Layer X.H. Guo, G.D. Yang, J.Y. Fu and K. Huang	202