

Table of Contents

Preface

Table of Contents

1. Introduction

H.J. Osten 1

2. Growth of Epitaxial $\text{Si}_{1-y}\text{C}_y$ and $\text{Si}_{1-x-y}\text{Ge}_x\text{C}_y$. 2.1 Basic Considerations

H.J. Osten 3

2.2 The Concept of Surface Solubility 4

2.3 Substitutional versus Interstitial C Incorporation 5

2.4 Segregation of Carbon-Containing Complexes 15

3. Mechanical and Structural Properties. 3.1 Strain Manipulation

H.J. Osten 18

3.2 Thermal Stability 20

3.3 Strain-Compensated Ternary Alloys 22

4. Electrical Properties of C Containing Alloys on Si(001). 4.1 Band Gap Changes and Band Offsets

H.J. Osten 25

4.2 Charge Transport 38

5. Highly Concentrated Pseudomorphic $\text{Si}_{1-y}\text{C}_y$ Layers

H.J. Osten 48

5.1 Model Considerations 49

5.2 Experimental Verification 51

5.3 Formation of Carbon-Rich Surface in Silicon 52

6. Application of SiGe:C in Heterojunction Bipolar Transistors

H.J. Osten 56

6.1 Suppressed Dopant Diffusion in Carbon-Rich Silicon 57

6.2 Advanced Heterojunction Bipolar Transistors with SiGe:C 59

6.3 Conclusion 69

7. Summary and Outlook

H.J. Osten 70

Acknowledgement

References