

Low Dimensional Structures Prepared by Epitaxial Growth or Regrowth on Patterned Substrates

Significant experimental work is devoted to the preparation of one and zero dimensional semiconductor structures in view of future electronic and optical devices which involve quantum effects. The aim is good control in the realisation of nanometer structures both in vertical and lateral direction. Conventional processing techniques based on lithography face inherent problems such as limited resolution and surface defects caused by reactive ion etching. During the last few years several research groups started working on direct syntheses of semiconductor nanostructures by combining epitaxial growth techniques such as molecular beam epitaxy and chemical vapour deposition with pre patterning of the substrate wafers. Another idea is based on island formation in strained layer heteroepitaxy. Zero and one dimensional structures with dimensions down to a few atomic distances have been realised this way. An important point is that the size of the quantum structures is controlled within the epitaxial deposition in a self-adjusting process. The main subjects of the book are: Theoretical aspects of epitaxial growth, selfassembling nanostructures and cluster formation, epitaxial growth in tilted and non-(001) surfaces, cleaved edge overgrowth, nanostructure growth on patterned silicon substrates, nanostructures prepared by selective area epitaxy or growth on patterned substrates, in-situ etching and device applications based on epitaxial regrowth on patterned substrates. The experimental work mainly concentrated on GaAs/AlGaAs, GaAs/InGaAs, InGaP/InP and Si/SiGe based semiconductor heterostructures. Growth related problems received special attention. The different concepts for preparation of low dimensional structures are presented to allow direct comparison and to identify new concepts for future research work.

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213,99 €

199,99 € (zzgl. MwSt.)

Lieferfrist: bis zu 10 Tage

Artikelnummer: 9780792336792

Medium: Buch

ISBN: 978-0-7923-3679-2

Verlag: Springer

Erscheinungstermin: 31.08.1995

Sprache(n): Englisch

Auflage: 1995

Serie: NATO Science Series E:

Produktform: Gebunden

Gewicht: 1640 g

Seiten: 386

Format (B x H): 160 x 241 mm

