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1.9 Other mechanisms for interlayer correlation formation; 1.9.1 Morphologic correlations; 1.9.2 Correlations induced by composition; 1.10 Summary and outlook; Acknowledgements; Chapter 2 InAs Quantum Dots on Al $[sub(x)]$ Ga $[sub(1-x)]$ As Surfaces and in an Al $[sub(x)]$ Ga $[sub(1-x)]$ As Matrix; 2.1 Introduction; 2.2 Quantum dot formation; 2.2.1 Strained heteroepitaxial growth; 2.2.2 Quantum dot nucleation on Al $[sub(x)]$ Ga $[sub(1-x)]$ As surfaces; 2.2.3 Calibrating InAs growth rate; 2.3 Control of quantum dot size and density
2.3.1 QD nucleation and growth
2.4 Changing the confining matrix; 2.5 Overgrowth of quantum dots; 2.5.1 QD characterization; 2.5.2 Inhomogeneous broadening of QD size; 2.6 Applications; 2.6.1 Quantum dot detectors; 2.6.2 Quantum dot quantum-cascade emitters; Chapter 3 Optical Properties of In(Ga)As/GaAs Quantum Dots for Optoelectronic Devices; 3.1 Introduction; 3.2 Growth of In(Ga)As/GaAs QDs; 3.3 Stacked QD layers; 3.4 Energy states in QDs; 3.5 Single QD spectroscopy; 3.6 Quantum dot lasers; 3.7 Vertical and resonant cavity structures; 3.8 Semiconductor optical amplifiers
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3.10 Entangled photon sources; 3.11 Spin-LEDs and the potential for QDs in spintronic devices; 3.12 Conclusions; Acknowledgements; Chapter 4 Cavity Quantum Electrodynamics with Semiconductor Quantum Dots; 4.1 Introduction; 4.2 Basics of cavity quantum electrodynamics; 4.2.1 Optical confinement and light-matter interaction; 4.2.2 Spontaneous emission control - Purcell effect; 4.2.3 Strong coupling regime; 4.3 Implementation of cavity quantum electrodynamics in the solid state; 4.3.1 The resonator: a semiconductor microcavity
4.3.2 The emitter: a single semiconductor quantum dot

Sommario/riassunto

In 1969, Leo Esaki (1973 Nobel Laureate) and Ray Tsu from IBM, USA, proposed research on "man-made crystals" using a semiconductor superlattice (a semiconductor structure comprising several alternating ultra-thin layers of semiconductor materials with different properties). This invention was perhaps the first proposal to advocate the engineering of a new semiconductor material, and triggered a wide spectrum of experimental and theoretical investigations. However, the study of what are now called low dimensional structures (LDS) began in the late 1970's when sufficiently thin epitaxial layers
