

285

Accession number:20123015274994

Title:Thermal annealing effect on the properties of GaBiAs

Authors:Butkute, Renata (1); Pacebutas, Vaidas (1); Cechavicius, Bronius (1); Adomavicius, Ramunas (1); Koroliov, Anton (1); Krotkus, Arunas (1)

Author affiliation:(1) Department of Optoelectronics, Center for Physical Sciences and Technology, Vilnius, Lithuania

Corresponding author:Butkute, R.(renata@pfi.lt)

Source title:Physica Status Solidi (C) Current Topics in Solid State Physics

Abbreviated source title:Phys. Status Solidi C Curr. Top. Solid State Phys.

Volume:9

Issue:7

Issue date:July 2012

Publication year:2012

Pages:1614-1616

Language:English

ISSN:18626351

E-ISSN:16101642

Document type:Journal article (JA)

Publisher:Wiley-VCH Verlag, P.O. Box 101161, Weinheim, D-69451, Germany

Abstract:The influence of thermal annealing on optical properties and carrier lifetime of dilute GaBi x As $1-x$ layers was investigated. Thick (0.5-1.5 μ m) relaxed and thin (30-100 nm) strained bismide layers were grown onto semi-insulating (100)-oriented GaAs substrates by molecular beam epitaxy (MBE) using As₄ and As₂, respectively. The post-growth annealing was carried out in the rapid thermal annealing (RTA) oven at the temperatures ranging from 550 $^{\circ}$ C to 750 $^{\circ}$ C under nitrogen atmosphere. The high resolution X-ray diffraction (HRXRD), photoluminescence (PL) and optical pump-THz probe measurements revealed two different GaBi x As $1-x$ anneal mechanisms. The annealing at temperatures higher than 600 $^{\circ}$ C caused a significant reduction of carrier lifetime of relaxed bismide layers with $x > 0.05$. Meanwhile, thick layers with a smaller content of Bi ($x < 0.05$) and thin strained layers annealed up to 600 $^{\circ}$ C still exhibited long carrier lifetimes. On the other hand, the significant photoluminescence signal increase at room and liquid nitrogen temperatures was observed for the GaBiAs layers grown using As₂. \copyright 2012 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.

Number of references:8

Main heading:Rapid thermal annealing

Controlled terms:Carrier lifetime - Molecular beam epitaxy - Optical properties - Optical pumping - Photoluminescence - X ray diffraction

Uncontrolled terms:Dilute bismides - GaAs substrates - High-resolution x-ray diffraction - Liquid nitrogen temperature - Nitrogen atmospheres - Photoluminescence signals - Postgrowth annealing - Probe measurements - Semi-insulating - Strained layers - Thermal annealing effects - Thermal-annealing - Thick layers - Thz spectroscopy

Classification code:537.1 Heat Treatment Processes - 701.1 Electricity: Basic Concepts and Phenomena - 741.1 Light/Optics - 931.3 Atomic and Molecular Physics - 933.1.2 Crystal Growth

DOI:10.1002/pssc.201100700

Database:Compendex

Compilation and indexing terms, Copyright 2012 Elsevier Inc.