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Gallium Arsenide Lasers

Merlin D. Ring



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Gallium Arsenide Lasers C. H. Gooch, 1969 **HIGH-POWER GALLIUM ARSENIDE LASER DIODES.** L. Wandinger, K. L. Kohn, ARMY ELECTRONICS COMMAND FORT MONMOUTH N J ELECTRONIC COMPONENTS LAB., 1965

The essential features in the design development and performance of GaAs p n junction laser diodes with high output in the coherent beam for application in secure communication systems are discussed After a brief review of device design principles the technology of wafer preparation diffusion of extremely planar p n junctions and the formation of ohmic low resistance area contacts developed at this Command is presented Measurement techniques to determine the performance characteristics of these lasers such as threshold current density output power external quantum efficiency spectral distribution and linewidth of emitted radiation are discussed Experimental units with a total average power output in the coherent beam of more than three watts corresponding to a quantum efficiency of 15 percent have been made Author

Gallium Arsenide Phosphide Injection Laser Diodes Carl J. Magee, 1967 *Fabrication and Analysis of a Gallium Arsenide Laser Diode* Thomas John Curry, 1966 **A Technological Forecast for Gallium Arsenide Lasers** Harold Muschott Olson, 1974 A technological forecast for GaAs injection lasers operating at room temperature is made It indicates significant technological progress followed by widespread use for optical waveguide communications in the early 1980 s Extrapolated values for power efficiency lifetime threshold current and cost per watt are tabulated for the years 1976 and 1980 Two trend extrapolation techniques based on the different assumptions that technological progress advances exponentially with time and that technological progress advances exponentially with cumulative production are compared The technological progress function which uses patent output as a measure of cumulative production is determined to be the best measure in the case of the injection laser Author **(Aluminum-gallium) Arsenide Semiconductor Lasers and Integrated Optoelectronics** Daniel Paul Wilt, 1981 **Lasers and Masers**, 1962 **The Operation of Gallium Arsenide Lasers at Intermediate Temperatures** John Philip Davies, 1968 **Gallium Arsenide and Related Compounds 1992, Proceedings of the 19th INT Symposium, 28 September-2 October 1992, Karuizawa, Japan** Ikegami, 1993-01-01 Bringing together international experts from 16 countries Gallium Arsenide and Related Compounds 1992 focuses on device applications for Gallium Arsenide and related compounds A topic of importance discussed is the first GaAs supercomputer from Fujitsu The book also explores carbon doping and device applications in laser diodes light modulators and amplifiers emphasizing business opportunity in consumer applications such as personal communications and TV tuners It includes an account of the use of scanning tunneling microscopies in GaAs and related compounds This book is ideal for physicists materials scientists and electronics and electrical engineers involved in III V compound research

Gallium Arsenide Laser for Cooperative Target Tracking Norman Edward Heger, 1970 **The Fabrication of Double Heterostructure Aluminum Gallium Arsenide/gallium Arsenide Lasers by Molecular Beam Epitaxy** Timothy James

Drummond,1982 Today there exists a need to be able to process increasing amounts of data at rates beyond the capabilities of existing purely electrical networks To meet this need networks which transmit data via an optical carrier rather than an electrical one are being developed A necessary component of an optical network is a small easily modulated source of coherent light The only such source available is a laser diode The first laser diode to operate continuously at room temperature was a double heterostructure DH Al Ga As GaAs laser prepared by liquid phase epitaxy LPE Much effort was subsequently devoted to reproducing those results by molecular beam epitaxy MBE MBE offers several advantages over LPE such as control of composition and impurity profiles to atomic dimensions Layers can be grown on larger substrates and with a high degree of uniformity and reproducibility that is not possible with LPE Despite these advantages it was six years after the first continuous room temperature operation of an Al Ga As GaAs DH laser that a similar laser prepared by MBE was reported The first MBE lasers typically had threshold current densities J_{th} about twice as large as similarly designed LPE lasers Another three years passed before the art of MBE advanced to the point where it became possible to achieve laser performance equal to the LPE lasers The presence of non radiative recombination centers in the bulk Al Ga As layers was shown to make a significant contribution to the high threshold current densities in MBE lasers **Q-switching in**

Semiconductors Kemal Kumcu,1981 *Lasers and Masers: a Continuing Bibliography* United States. National Aeronautics and Space Administration,1965 **Gallium Arsenide and Related Compounds 1993, Proceedings of the 20th INT**

Symposium, 29 August - 2 September 1993, Freiburg im Braunschweig, Germany Günter Weimann,Hans S. Rupprecht,G. Weimann,1994-01-01 Gallium Arsenide and Related Compounds 1993 covers III V compounds from crystal growth of materials to their device applications Focusing on the fields of optical communications and satellite broadcasting the book describes the practical applications for GaAs and III V compounds in devices and circuits both conventional and those based on quantum effects It also discusses ultrafast GaAs transistors and integrated circuits novel laser diodes and tunneling devices and considers the direction for future technologies In addition this volume addresses the increasing demands of ultra high speed systems that require careful selection of III V materials to optimize the performance of electronic and optoelectronic components It is ideal reading for physicists materials scientists electrical and electronics engineers investigating III V compound materials properties and devices Ocular Hazard of the Gallium Arsenide (GaAs)

Laser David J. Lund,Dolph O. Adams,Charles Carver,LETTERMAN ARMY INST OF RESEARCH SAN FRANCISCO CALIF.,1976 The Gallium Arsenide GaAs Semiconductor laser is finding application in many devices which subject human eyes to laser irradiation This study evaluated a single diode laboratory device to determine an ED50 level in rhesus monkeys The RCA 7610 GaAs laser diode used in this experiment was cooled to cryogenic temperature 77K to allow rapid pulsing thus increasing average power enough to create retinal burns Temperature Dependence of the Emission Wavelength of a Gallium Arsenide Laser Diode Merlin D. Ring,1971 *Simulated Coherent Radiation Devices (lasers).* ,1986

Manufacturability of Gallium Arsenide/aluminum Gallium Arsenide Lasers Grown by Molecular Beam Epitaxy Sridhar V. Iyer,1994 The performance of high power graded index separate confinement heterostructure single quantum well lasers grown by molecular beam epitaxy depends primarily on the quality of Alsb x Gasb 1 x As layers the interface roughness and the control of residual oxygen incorporation into the active region Based on MBE growth experiments a model for the incorporation desorption and accumulation of oxygen during epitaxial growth of optical quality AlGaAs layers is proposed and validated Based on this model an optimal growth scheme for MBE grown GaAs AlGaAs lasers is demonstrated Over the growth of approximately one hundred and fifty lasers in a concurrent research development and manufacturing environment the reduction of residual oxygen incorporation in GRINSCH SQW lasers was found to be in excellent correlation with lower threshold density higher quantum well photoluminescence intensity and secondary ion mass spectroscopy data The high growth temperatures required to prevent oxygen incorporation in the quantum well result in additional technical obstacles stymieing full exploitation of the growth technology for use in the manufacture of integrated opto electronic circuits and systems The inherent difficulties in accurately measuring growth temperature in MBE systems and the gallium desorption during high temperature growth can lead to nonuniformities in cladding material composition These nonuniformities can lead to an asymmetrical waveguiding structure with distorted optical output characteristics Distortions in the radiated optical pattern can greatly affect the alignment and coupling efficiency between laser diodes and optical fibers or other electro optical systems in integrated opto electronic applications A two dimensional dielectric waveguide simulator has been used to analyze the optical properties of GRINSCH GaAs AlGaAs lasers with asymmetrical cladding structures induced by noise in growth temperature measurement Through this analysis an optimal device structure which has the desired optical characteristics and is less sensitive to cladding composition asymmetries is demonstrated

Properties of Gallium Arsenide Diode Lasers Christian Deutsch,1968 **Radiation from Gallium Arsenide Lasers** Michael Hugh Boyle,King's College London. Department of Physics,1967

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