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Patent Search

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Inventor

Name	Address	Country	Nat
Dr.K. Prathap	Malla Reddy Institute of Engineering & Technology, Maisammaguda, Secunderabad, Hyderabad, Telangana-500100.	India	Indi
Dr.E.Venkateshwar Rao	University College, Kakatiya University, Hanamkonda, Warangal, Telangana-506009.	India	Indi
Archana Devi Annapuram	Malla Reddy College of Engineering and Technology (Autonomous),Maisammaguda, Dhulapally, Hyderabad, Telangana-500100.	India	Indi
Hari kamalasree	Malla Reddy College of Engineering and Technology (Autonomous), Maisammaguda, Dhulapally, Hyderabad, Telangana-500100.	India	Indi
Dr. K Mohan Babu	Sri Venkateshwara College of Engineering, Tirupati, AP- 517507.	India	Indi
Dr.B.Hemalatha	CMR Technical Campus, Medchal, Hyderabad, Telangana-501401.	India	Indi
Dr.V Anitha Rani	Institute of Aeronautical Engineering, Dundigal, Hyderabad, Telangana-500043.	India	Indi
T. Mohan Kumar	B V Raju Institute of Technology, Vishnupur, Narsapur, Medak, Telangana-502313.	India	Indi

Applicant

Name	Address	Country	Nat
Dr.K. Prathap	Malla Reddy Institute of Engineering & Technology, Maisammaguda, Secunderabad, Hyderabad, Telangana-500100.	India	Indi
Dr.E.Venkateshwar Rao	University College, Kakatiya University, Hanamkonda, Warangal, Telangana-506009.	India	Indi
Archana Devi Annapuram	Malla Reddy College of Engineering and Technology (Autonomous),Maisammaguda, Dhulapally, Hyderabad, Telangana-500100.	India	Indi
Hari kamalasree	Malla Reddy College of Engineering and Technology (Autonomous), Maisammaguda, Dhulapally, Hyderabad, Telangana-500100.	India	Indi
Dr. K Mohan Babu	Sri Venkateshwara College of Engineering, Tirupati, AP- 517507.	India	Indi
Dr.B.Hemalatha	CMR Technical Campus, Medchal, Hyderabad, Telangana-501401.	India	Indi
Dr.V Anitha Rani	Institute of Aeronautical Engineering, Dundigal, Hyderabad, Telangana-500043.	India	Indi
T. Mohan Kumar	B V Raju Institute of Technology, Vishnupur, Narsapur, Medak, Telangana-502313.	India	Indi

Abstract:

Abstract The present study focuses on the use of hetero-structures to improve semiconductor device efficiency. It outlines the primary approaches to material selection ar types of hetero-structures used in the study, such as silicon, gallium arsenide, and indium gallium nitride. The current study examines multiple hetero-structure configurat and recommends the most promising ones for further research in this field. The materials were synthesised utilising specialist equipment, specifically MBE and MOCVD, ar the structures were later characterised by XRD and SEM. As evidenced by the results, some hetero-structure configurations, particularly GaAs/GaN hetero-structures, are c of positively affecting the optical and electrical characteristics of semiconductor devices. They show up to a 15% efficiency improvement when compared to devices based single material. Furthermore, the carrier mobility increases for these structures, and the interface quality decreases, indicating the high contribution of the specific materia hetero-structure and precise material engineering. Therefore, the experimental results presented in this study confirm the predictions made in the theoretical research an validate the importance of interface quality in integrating new materials into semiconductor devices to achieve superior characteristics. Moreover, the results of the study an insight into upcoming materials' distinctive features and allow for the establishment of further research areas of material selection and device connection to positively i the electronic and photonic device creation industry.

Complete Specification

Description:Exploring Hetero Structure Integration for Novel Semiconductor Devices and Power Efficiency Optimization

Field and Background of the Invention

Semiconductor technologies are constantly developing and contributing to progress in a wide variety of applications, from mundane consumer electronics to complex computing devices and renewable energy solutions. All of them are enabled by mobile electrons provided by various semiconductor devices. At the core of those developments lies the search for and utilization of innovative materials and fabrication techniques, and one of the most promising directions is hetero-structure integrat

The purpose of the present research is to explore hetero-structure integration and its applicability to the creation of novel semiconductor devices with a focus on improv power efficiency. This is both a major issue and a major opportunity for the field. Hetero-structures are designs utilizing materials with different band gap energies and electronic properties; when layered properly, those materials implicate greater performance, starting from enhanced electron mobility and thermal stability to improved optical properties. Such performance is essential in many applications, ranging from high-performance solar panels to high-powered transistors and LEDs. However, disparate material usage presents its challenges, such as uncontrollable defects on the interface, thermally-induced problems, and more; such issues may hinder devices performance and capabilities, and therefore novel fabrication techniques are often necessary.

The main purpose of this research is to determine the impact of hetero-structure integration on the electrical properties of semiconductor devices and efficiency in gene Based on the materials and possible layered elements, it is possible to suggest structures that may optimise power usage and not change the base concept and operatio principles. Therefore, we must extensively examine parameters such as the physical and chemical state of the interfaces, the interaction of electrons in layers, and their

View Application Status

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