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STRUCTURAL PROPERTIES OF INAS NANOWIRES GROWN BY MBE ON GRAPHENE-COATED SUBSTRATES

Nanoscale semiconductor materials are among the most promising technologies for developing novel optoelectronic devices. This potential is especially significant when using well-known, highly remarkable semiconductor materials like those from the III-V family, with indium arsenide (InAs) being a notable example. InAs, with its direct band gap and high electron mobility at room temperature, is particularly suitable for integration into nanowire manufacturing for optoelectronic applications in the near to mid-infrared range. In this study, we present a novel approach to fabricating InAs nanowires using molecular beam epitaxy (MBE) on Si (111) substrates coated with a monolayer of graphene. This innovative substrate configuration promotes more uniform nanowire growth, enhancing the performance and reliability of the resulting optoelectronic devices. InAs nanowires were grown by MBE on Si (111) substrates coated with graphene at various temperatures, as well as on Si substrates without graphene. Structural and microscopic studies were conducted to observe the presence and distribution of the nanowires on the substrates. High-resolution X-ray diffraction (HR-XRD) analysis confirmed the presence of crystalline InAs on the surface of the Si (111) substrates, with reflections corresponding to the 111, 022, and 222. Scanning electron microscopy (SEM) micrographs provided insights into the morphology and overall distribution of the nanowires. These studies offer evidence supporting the formation of the proposed nanostructures. Overall, the growth of InAs nanowires on Si (111) substrates, particularly those coated with graphene, demonstrates promising structural characteristics and distribution, affirming their feasibility for integration into optoelectronic devices.

Keywords

InAs nanowires, Molecular Beam Epitaxy (MBE), Graphene-coated substrates, III-V semiconductors

Reference

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