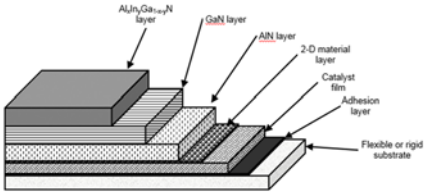
Flexible Single-Crystal Semiconductor

Heterostructures by Direct Growth and Methods of Making Thereof



Summary

An innovative method to produce flexible III-V material based semiconductors. The method allows for the growth of III-V materials directly onto a substrate. Graphene is used as an intermediate layer between the III-V material and the substrate. The graphene layer is grown on the substrate with the assistance of a metal catalyst layer. Aluminum nitride is layered on top of graphene to facilitate the growth of the III-V material and the III-V material is grown on the aluminum nitride layer. Thus, this invention provides a direct and efficient method of growing III-V materials directly on substrates. The method can utilize flexible substrates, producing a more durable and functional semiconductor than traditional crystalline substrates. This method can also utilize traditional crystalline substrates, like silicon, allowing for integration of III-V semiconductors in silicon devices. Furthermore, this method also allows for roll-to-roll processing, creating an easier and more cost-effective method of manufacturing III-V material semiconductors.

Competitive Advantages

- Utilizes III-V materials which have greater electronic and photonic capabilities than traditional silicon semiconductors
- Ability to grow III-V semiconductors on both flexible and rigid substrates using a graphene intermediate layer
- Unique method of growing III-V semiconductors directly on the substrate, which allows for efficient roll-to-roll processing of the semiconductors

Meet the Inventor

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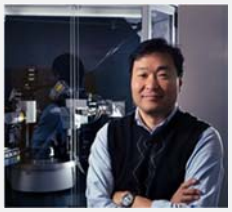

Problem Addressed

- Increasing the electronic and photonic capabilities of semiconductors
- Growing the semiconductor layers directly upon a variety of substrates rather than transferring layers onto a substrate
- Resolving the dislocation between III-V materials and crystalline substrates
- Developing an efficient manufacturing process for III-V semiconductors

Applications

- LEDs
- High electron mobility transistors (HEMT)
- RF electronics
- Wearable electronics

Patents

- PCT/US2017/037457
- NPA: US2017/050844

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