PRECISION GRAPHENE NANORIBBON WIRES FOR MOLECULAR ELECTRONICS SENSING AND SWITCH

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PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20230093984	03/30/2023	2021-147

Additional Patent Pending

BRIEF DESCRIPTION

The inventors have developed a highly scalable multiplexed approach to increase the density of graphene nanoribbon- (GNR) based transistors. The technology forms a single device/chip (scale to 16,000 to >1,000,000 parallel transistors) on a single integrated circuit for single molecule biomolecular sensing, electrical switching, magnetic switching, and logic operations. This work relates to the synthesis and the manufacture of molecular electronic devices, more particularly sensors, switches, and complimentary metal-oxide semiconductor (CMOS) chip-based integrated circuits.

Bottom-up synthesized graphene nanoribbons (GNRs) have emerged as one of the most promising materials for post-silicon integrated circuit architectures and have already demonstrated the ability to overcome many of the challenges encountered by devices based on carbon nanotubes or photolithographically patterned graphene. The new field of synthetic electronics borne out of GNRs electronic devices could enable the next generation of electronic circuits and sensors.

SUGGESTED USES

The immediate application of this technology will be integration of GNR as highly sensitive parallelized sensors for biologically relevant systems including but not restricted to DNA sequencing, or high sensitivity detection of analyses (e.g. virus RNA).

Future applications include:

in the medium term, the integration of GNRs with CMOS architectures as electrical or magnetic switches that promise to increase the switching speed of integrated circuits from gigahertz to petaherz (5 orders of magnitude) while simultaneously lowering the power consumption by three orders of magnitude.
in the long term, the implementation of GNR-based qubits for quantum computing.

ADVANTAGES

This invention overcomes one of the grand, formidable engineering challenges in graphene nanoelectronics technology: the controlled assembly of highly parallelized GNR electronic device architectures. The technological advancement makes it possible to access GNR-based functional materials and electronic devices for seamless integration with, as well as augmentation and outperformance of, current semiconductor nanotechnology.

RELATED MATERIALS

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OTHER INFORMATION

KEYWORDS

Graphene nanoribbon, GNR, transistor

CATEGORIZED AS

» **Biotechnology**
» Bioinformatics
» Genomics
» Industrial/ Energy
» **Computer**
» Hardware
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» **Semiconductors**

» Materials

RELATED CASES

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ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Reticulation Of Macromolecules Into Crystalline Networks
- Automated Tip Conditioning ML-Based Software For Scanning Tunneling Spectroscopy

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