

# LOW BAND GAP GRAPHENE NANORIBBON ELECTRONIC DEVICES

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## PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20220282029	09/08/2022	2019-145

## BRIEF DESCRIPTION

This invention creates a new graphene nanoribbons (GNR)-based transistor technology capable of pushing past currently projected limits in the operation of digital electronics for combining high current (i.e. high speed) with low-power and high on/off ratio. The inventors describe the design and synthesis of molecular precursors for low band gap armchair graphene nanoribbons (AGNRs) featuring a width of N=11 and N=15 carbon atoms, their growth into AGNRs, and their integration into functional electronic devices (e.g. transistors). N is the number of carbon atoms counted in a chain across the width and perpendicular to the long axis of the ribbon.

## SUGGESTED USES

The long-term potential of this technology is to create a new GNR-based transistor technology capable of pushing past currently projected limits for combining high current (i.e. high speed) with low-power and high on/off ratio in the operation of digital electronics. These GNR nanostructures have great promise in this regard since they exhibit uniform, homogeneous, and ultra-narrow ribbon width, atomically smooth edges, and uniform bandgap. They are anticipated to exhibit excellent electron transport characteristics and are therefore potentially ideal for use as the channel material in post-silicon complementary metal-oxide-semiconductor (CMOS) transistors, enabling the ultimate scaling of high performance digital electronics. Further, GNR 1D heterostructures have recently been grown, in which the ribbon width (hence bandgap) is varied along the length of the ribbon, opening up possibilities for novel tunneling devices with super-steep subthreshold slope for ultra-low voltage operation.

## ADVANTAGES

These GNR nanostructures exhibit uniform, homogeneous, and ultra-narrow ribbon width, atomically smooth edges, and uniform bandgap. They are anticipated to exhibit excellent electron transport characteristics and are therefore potentially ideal for use as the channel material in post-silicon CMOS transistors, enabling the ultimate scaling of high performance digital electronics.

## RELATED MATERIALS

### ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ [Reticulation Of Macromolecules Into Crystalline Networks](#)
- ▶ [Precision Graphene Nanoribbon Wires for Molecular Electronics Sensing and Switch](#)
- ▶ [Automated Tip Conditioning ML-Based Software For Scanning Tunneling Spectroscopy](#)

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## INVENTORS

- » Fischer, Felix Raoul

## OTHER INFORMATION

### CATEGORIZED AS

- » **Computer**
- » Hardware
- » **Materials & Chemicals**
- » Nanomaterials
- » **Nanotechnology**
- » Electronics
- » **Semiconductors**
- » Materials

### RELATED CASES

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