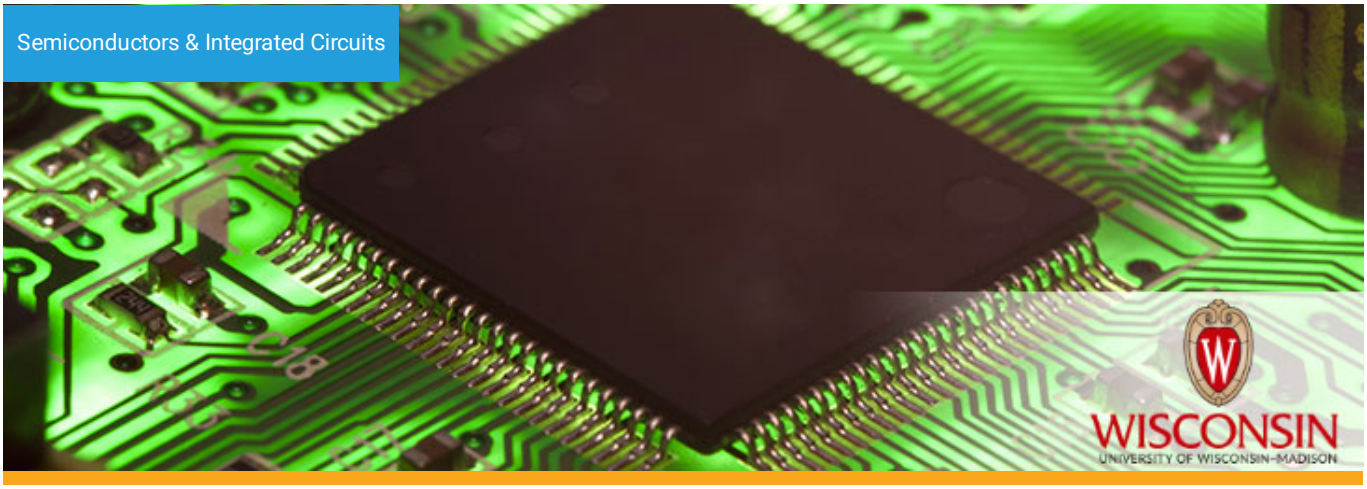

TRANSFER OF NANOSTRUCTURES USING CROSSLINKABLE COPOLYMER FILMS

View U.S. Patent Application Publication No. US-2022-0306475 in PDF format.

WARF: P210256US01

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Overview

Semiconducting graphene nanoribbons are promising candidates for succeeding and/or complementing silicon (Si) in logic microprocessors and Group III-V compounds in radio frequency devices and for integrating into emerging thin film, optoelectronic, spintronic, and quantum devices because of their large current-carrying capacity, high carrier velocity, bandgap tunability, and outstanding thin-body electrostatic control. To meet the demands of most of these applications, nanoribbons narrower than 5 nm are desirable, as they can have technologically relevant bandgaps arising from quantum confinement effects.

The Invention

UW researchers have developed a method for transferring sub-10 nm width graphene nanoribbons to other substrates with high yields. The key to the improved method is the use copolymer polymerized from non-crosslinking monomers and comonomers.. The method should also work well with carbon nanotubes, quantum dots, nanowires, etc. For example, after synthesis, nanoribbons are transferred to SiO2 on Si with a copolymer of crosslinkable PMMA. The copolymer consisting of 96 mol % MMA with 4 mol % of thermally cross-linkable GMA, PMMA-GMA, is spin-coated on the sample, and the films are thermally annealed to promote better bonding of the copolymer with the nanoribbon/Ge substrate. Excess polymer is removed by rinsing in toluene, resulting in a film that is 3 to 5 nm in thickness. Additional PMMA is spin-coated on top of the PMMA-GMA film, and the substrate is annealed in a nitrogen environment. The backside of the sample that is uncoated with polymer undergoes an oxygen plasma etch to remove graphene. The sample is then floated on 3:1:1 H2O:HF:H2O2 to etch the Ge substrate. The nanoribbon/polymer membrane is transferred from the Ge etchant to three successive water baths and finally to a piranha cleaned SiO2 on Si substrate. The substrate is spin dried and then annealed in an N2 environment. The substrate is soaked in acetone and subsequently thermally annealed to remove polymer residue.

Additional Information

For More Information About the Inventors

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Tech Fields

- Semiconductors & Integrated Circuits : Design & fabrication

For current licensing status, please contact Jeanine Burmania at jeanine@warf.org or 608-960-9846