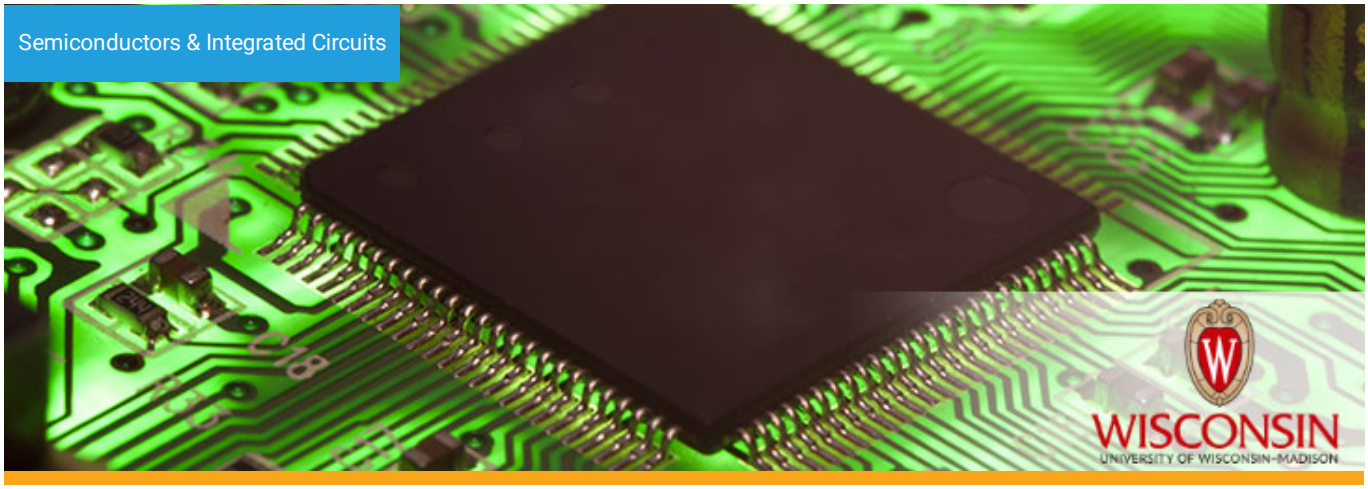

Improved Method for Forming Nanoscale Structures Using Solvent Annealing of Block Copolymers

View U.S. Patent No. 9,299,381 in PDF format.

WARF: P110192US02

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing methods that use solvent annealing for the directed assembly of block copolymers on patterned substrates for use in microelectronics.

Overview

Devices in fields including electronics, photonics and biological engineering utilize 2-D and 3-D nanostructures. Traditional patterning methods such as photolithography and electron beam lithography have been adequate for fabricating these structures from block copolymer assemblies; however, these methods are limited in the features that can be formed and in the fabrication of 3-D structures as the microelectronics industry expands and the demand for smaller devices increases. A new method for forming nanoscale structures via block copolymer assemblies is needed.

UW–Madison researchers have previously developed an improved method of creating dense, uniform nanoscale patterns via integration of lithographic techniques and self-assembling block copolymer technology (see WARF reference number P09061US). The method improves pattern quality and throughput of current optical lithography techniques and can be integrated into existing nanoscale manufacturing processes.

The Invention

UW–Madison researchers now have developed methods of fabricating block copolymer thin film structures by solvent annealing, which can be performed at temperatures lower than the thermal annealing used in the previous method and may be useful for block copolymers that are not amenable to thermal annealing. One method includes providing a substrate pattern, depositing a block copolymer material on the substrate pattern and inducing the formation of microphase-separated domains in the block copolymer material by solvent annealing. Another method comprises providing a block copolymer film on a substrate pattern, exposing the block copolymer film on the substrate pattern to a solvent to direct the assembly of the block copolymer film and then evaporating the solvent.

Applications

- Electronics
- Photonics
- Biological engineering

Key Benefits

- High degrees of pattern perfection can be achieved.
- Improves dimensional control of features
- Improves line-edge and line-width roughness
- Enhances resolution by factors of two to four or greater
- Solvent annealing can be performed at temperatures lower than thermal annealing.
- Solvent-annealed materials will assemble correctly over a range of pattern dimensions, providing increased flexibility.

Additional Information

Related Technologies

- WARF reference number P09061US describes an improved method to create dense, uniform nanoscale patterns via integration of lithographic techniques and self-assembling block copolymer technology.

Tech Fields

- Semiconductors & Integrated Circuits : Lithography

For current licensing status, please contact Emily Bauer at emily@warf.org or 608-960-9842