Selective Spin-On Deposition of Polymers

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BACKGROUND

Photolithographic processes that underpin microprocessor fabrication rely on iterative thin film processing to construct complex three-dimensional structures. Demand for faster device speeds and higher chip densities has necessitated highly intricate design targets that require more processing steps and therefore involve higher fabrication costs. Techniques that selectively deposit material onto specific regions of heterogeneous substrates hold the potential to simplify and reduce the cost of next-generation photolithography. A common strategy to control the localization of both inorganic and polymeric thin films involves the used of self-assembled monolayers (SAMs) to manipulate substrate surface chemistry to either block or promote deposition. While SAMs have previously been used to influence the spatial distribution of polymer films on homogeneous substrates, there is a need develop this capability for heterogeneous surfaces (e.g., metal/dielectric).

DESCRIPTION

Researchers at the University of California, Santa Barbara have developed a selective spin coating deposition technique that requires no post-processing or subsequent steps to generate thin film patterns on heterogeneous substrates. First, a SAM is selectively deposited over just one of the substrate materials. Consequently, when the substrate is exposed to a polymer solution and spun, the solution dewets from the SAM and a polymer coating is formed only over the non-SAM functionalized regions. This technique, which is capable of templating thinner subsequent layers at a faster rate and with fewer resources, enables more precise control over the spatial distribution of polymeric thin film, and can be used for microelectronics tasks such as protecting copper while biasing growth only on silicon dioxide.

ADVANTAGES

- Fast, cheap, and scalable fabrication process for heterogeneous surfaces
- No post-processing required after spin coating
- Compatible with existing chemical and topographic templates
- Does not require perfect self-assembled monolayers

APPLICATIONS

- Photolithography
- Microelectronics

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OTHER INFORMATION

KEYWORDS

thin film, photolithography, spin coating, self-assembled monolayer, heterogeneous, substrate, microelectronics, microprocessor, fabrication

CATEGORIZED AS

- **Materials & Chemicals**
  - Thin Films
- **Semiconductors**
  - Processing and Production

RELATED CASES

2019-152-2

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,628,467	04/18/2023	2019-152

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Self-Aligned Deposition via Spin Coating without Pretreatment

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