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UNIVERSITY OF WISCONSIN-MADISON

Method and Apparatus for Etching and Deposition Using Microplasmas

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a method of using microplasmas to add or remove material over large substrate areas.

Overview

Plasmas are used routinely to etch and deposit thin films of materials on substrates, such as semiconductors, during the manufacturing of integrated circuits (IC) and microelectromechanical systems (MEMS). Commercially, a single, reactive plasma is used to process an entire wafer. There are several drawbacks to this, however, including the need for larger, more expensive, and consistent plasmas because of the trend toward larger wafers (currently as large as 12 inches). Also, to deposit thin films of different materials in separate areas of the substrate requires several masking steps.

The Invention

UW-Madison researchers have developed a method for generating and using spatially localized microplasmas operating in parallel with one another to add or remove material over large substrate areas. This means that a plasma can be developed in a specific region, which is tailored to the treatment requirements of that region.

Applications

- Plasma processing during the manufacture of integrated circuits and microelectromechanical systems

Key Benefits

- Different regions of the substrate can be plasma-etched under varying conditions and amounts of time.
- Plasma can be confined to areas ranging from a few tens of microns to more than a centimeter.
- As in conventional etching, etch dimensions are confined to openings in the mask.
- Different materials can be deposited in various regions of the substrate without requiring separate lithography masks.
- By patterning the electrodes and varying the applied voltages over time in each particular region, the directionality and other properties of the plasma can be controlled.
- Microplasmas promise higher uniformity and capability, reducing the equipment costs associated with plasma manufacturing.
- May allow etching and deposition at much higher die-to-die uniformity than is possible with the existing equipment
- Potentially a lower-cost alternative to current plasma processing

Tech Fields

- [Materials & Chemicals : Other materials & chemicals](#)
- [Semiconductors & Integrated Circuits : Design & fabrication](#)

For current licensing status, please contact Mark Staudt at mstaudt@warf.org or 608-960-9845