PHOTORESIST

What is photoresist?

Photoresist is light-sensitive material used in the manufacture of microelectromechanical systems (MEMS) and nanoelectromechanical systems (NEMS). Processes such as photolithography and photoengraving form a patterned coating in the photoresist film.

Predominantly used in the manufacture of integrated circuits and flat panel displays, photoresist can be positive or negative. Positive photoresist becomes soluable when exposed to UV light, whereas negative photoresist becomes crosslinked and insoluable when exposed to UV light. Photoresist is applied to the surface of a wafer that has been treated with HMDS, which is a commonly used adhesion promoter to ensure the photoresist adheres properly to the wafer substrate. The most common method of applying photoresist is spin coating to achieve a thin uniform coating across the wafer. However, depending on the substrate and/or application, other photoresist application techniques may be used such as spray or extrusion coating.

Where is photoresist used?

Photoresist material for the integrated circuit industry is used for a variety of lithographic processes covering a wide range of exposure tools and processes. Applications range from sub-micron geometries to thick film applications. Photoresist materials can be applied to a large variety of substrates.

In the flat panel display industry, photoresist materials can also be used in a wide range of processes. Applications extend beyond the 5th generation spin coating, into advanced slit-coating processes. Photoresist materials are also available for roller coating and extrusion coating.

Photoresist and Innovation

As more complex lithographic patterning evolves, the need for advanced photoresist materials grows. Manufacturers are combining innovative process techniques and ancillary photoresist chemicals to further enhance photoresist performance and allow for improved imaging. For example, anti-reflective coatings improve the photoresist profile while reducing line width variation and increasing overall process windows. Innovative spin-on organic polymers (BARCs) can improve photoresist profiles at specific lithographic wavelength processes including i-Line, 248nm, 193nm and 193nm immersion.

The results can include faster etch rates and a wider operating process window, which lead to greater throughput and enable innovation. Thanks to photoresist and ancillary enhancements, advanced lithography techniques such as double patterning using 193nm immersion lithography tools are made possible.

Photoresist and Manufacturability

Innovations in manufacturing techniques and the use of chemically amplified (CA) photoresist have helped manufacturers achieve efficiencies necessary to manufacture cost effectively at submicron levels. Also, the introduction of key enabling ancillary products, including the use of anti-collapse rinse products, provides a wider process window for 193nm photoresist material while reducing the overall defect levels, resulting in higher yields.

Advances in photoresist

Advances in lithographic process technologies continue to influence innovation in photoresist material. Ongoing research explores ways to further improve the imaging and mechanical properties of photoresist material.

Learn how AZ-EM photoresist can optimize performance and manufacturability in your application.

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POLYMERS

The Power of Polymers in Advanced Device Manufacturing

Polymers help enable advanced device manufacturing. From improving dielectric properties to enhancing physical properties, polymers are an important element in today's ever scaling, yet highly robust electronics devices.

Polymers and Performance

Polymers can help advanced device manufacturers improve processing speeds and overall performance cost-effectively. One such polymer is a Poly (perhydrosilazane)-(SiH2NH) based inorganic spin-on dielectric (SOD) material, also referred to as PHPS. It's an effective polymer for integrated circuit manufactuing because of its excellent insulatingr properties and superior gap filling capabilities.

PHPS is effective, not only for its thermal properties, but also for its mechnical properties. The polymer's heat stability and excellent planarizing characteristics result in reduced topography and enable more complex layering. In fact, PHPS can be converted to SiO2, which has similar properties to high performance and more costly CVD films. Also marketed under the name AZ Spinfil®, PHPS is a polymer that's become the industry standard for FEOL gapfilling applications.

While the performance characteristics of polymers are integral to successful advanced device manufacturing, one must also consider the process as a whole. Manufacturability and cost is a significant consideration and an area where spin-on polymers can offer added benefits.

Polymers and Manufacturing

Scaling of IC devices creates many challenges to material suppliers. Applying innovative polymers such as PHPS can help to cost effectively improve scaling without comprimising device performance. The result is improved production yields and reduced manufactuing costs compared to CVD technology.

When total cost of ownership (COO) is considered, spin-on dielectric (SOD) polymers can offer significant advantages. Unlike CVD technology, PHPS does not require a hefty upfront equipment investment or ongoing equipment maintenance. This alone can significantly reduce COO while providing excellent performance to meet the device requirements.

So whether you're manufacturing flash memory, DRAM, microprocessor or other advanced devices, learn how AZ-EM polymers can improve performance and reduce manufacturing costs in your application.

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