



Defect Inspection of Extreme Ultraviolet Lithography Mask Blanks

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Inventors: Franco Cerrina, Adam Pawloski, Lin Zhu

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a method of inspecting extreme ultraviolet lithography mask blanks for defects.

Overview

Unlike the transparent masks used in traditional lithographic techniques, extreme ultraviolet (EUV) lithography uses reflective masks. To create these reflective masks, a mask blank first must be made by depositing multiple layers of material onto a substrate, forming an interference stack. This mask blank then can be patterned with a non-reflective material to create the final EUV lithography mask.

To ensure accurate reproduction of the mask pattern on the target wafer, the mask blank must be free of defects because defects in the interference stack may distort or reduce the intensity of the EUV rays reflected from the mask, resulting in a corresponding defect in the pattern formed on the target wafer. Deeply embedded defects, however, are very difficult to detect.

The Invention

UW-Madison researchers have developed a method for inspecting EUV lithography mask blanks for defects. A multi-layer EUV mask blank is coated with a layer of photoresist that has been mixed with a fluorescent dye. The mask blank then is exposed to a source of radiation such that the photoresist is fully exposed by the combination of direct and reflected radiation from the mask blank in areas of the mask blank in which there are no defects.

Using this method, photoresist will remain after development only in areas where defects are present. Because the remaining photoresist contains fluorescent dye, defects can be detected easily by illuminating the mask blank with the excitation wavelength of the dye and then observing the mask blank under a dark field microscope.

Applications

- Detection of EUV lithography mask blank defects

Key Benefits

- Can detect very small defects on the order of 50 nm or less, which corresponds to 12.5 nm or smaller defects in a 4X reduction system
- Able to reject background signals
- Faster than currently available methods
- Can use radiation sources other than EUV

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Tech Fields

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WARF
Wisconsin Alumni Research Foundation

| info@warf.org | 608.960.9850

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