EUV pellicle defect review using EUV ptychography microscope

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INTRODUCTION

EUV ptychography microscope

- EUV ptychography microscope is an actinic inspection tool using high-order harmonic generation (HHG) source and ptychographic imaging method
- The optic system of EUV ptychography microscope is designed to emulate EUV scanner’s oblique illumination

EUV generation of EUV ptychography microscope

- The numerical aperture (NA) of EUV ptychography microscope is about 0.125 and the resolution is about 53.74nm

EXPERIMENT

Imaging method - ptychography

- Image formation relationship of EUV ptychography microscope

Optical system of EUV ptychography microscope

- EUV ptychography microscope is an actinic inspection tool using high-order harmonic generation (HHG) source and ptychographic imaging method

Numerical aperture and resolution of EUV ptychography microscope

- The numerical aperture (NA) of EUV ptychography microscope is about 0.125 and the resolution is about 53.74nm

RESULTS & DISCUSSION

Programmed defect review of EUV pellicle

- Comparison of defect review results between optical microscope (left) and EUV ptychography microscope (right)

Comparison of reconstructed mask image and intensity profile

- Comparison of reconstructed mask image and intensity profile (a) Without pellet, (b) With contaminated pellet

SUMMARY & CONCLUSION

EUV ptychography microscope using high-order harmonic generation (HHG) source and ptychographic imaging method has been developed as an actinic inspection tool of EUV mask and pellicle

- The defect detectability of EUV ptychography microscope is confirmed by defect mapping
- If there is a particle that larger than 10 μm on the EUV pellicle, it can cause the final wafer patterning deterioration
- The feasibility of EUV ptychography microscope for EUV pellicle qualification and defect review is demonstrated

- Particles smaller than 5 μm also can cause EUV random scattering and loss, but do not affect the final wafer patterns due to focus-out in the image plane

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