Evaluation of EUV transmittance and mechanical strength of Si-based EUV pellicle film by nitrogen ion implantation

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During the EUV exposure process, EUV pellicles are needed to protect the EUV mask from defects and contamination that occur in the EUV lithography process. The EUV pellicle must be made of a thin film membrane for high EUV wavelength transmittance. Moreover, since the inside of the EUV exposure tool is in a high vacuum environment, the EUV pellicle gives stress to the membrane thin film. Therefore, it is very important to ensure mechanical robustness to endure such harsh environments.
In this paper, Si thin film was deposited by LPCVD method.
Nitrogen ions were implanted into the Si thin film using ion implantation equipment and annealed to allow covalent bonding with Si lattices.
This study investigated the transmittance and mechanical strength of silicon - based EUV films by controlling the nitrogen ion dose.
The transmittance of the EUV pellicle film was evaluated by the CSM(Coherent scattering microscopy) measurement instrument and the mechanical strength was evaluated by bulge test
As a result, we confirmed the correlation between the transmittance and the mechanical strength according to the nitrogen ion implantation amount
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