



| | |
|-------------------------------|---|
| 1. Title: | Defect repair of EUV absorber layer using low acceleration voltage FIB-GAE |
| 2. Full names of all authors: | Tsukasa Abe, Fujii Akiko, Hiroshi Mohri, Naoya Hayashi, Yuusuke Tanaka, Iwao Nishiyama and Suga Osamu |

3. Abstract body:

EUV mask is reflective type mask and it has reflective layer, capping layer, buffer layer and absorber layer. Absorber layer forms mask pattern. Buffer layer protects capping layer and reflective layer during the dry etching and defect repair of absorber layer pattern. After the defect repair of absorber layer, buffer layer has to be removed and capping layer protects reflective layer from the environment. Defect repair is one of key technology for defect free mask fabrication. AFM nano-machining and Charged-Particle (FIB, etc.) with Gas Assisted Etching are candidate of absorber layer defect repair technique. Last year, we presented evaluation results of AFM nano-machining repair technique. This presentation, we will report evaluation result of low acceleration voltage FIB-GAE repair technique.

Designed defect mask was prepared for this evaluation. The test mask has 90nm thick LR-TaN for absorber layer, 10nm thick CrN for buffer layer, 11nm thick Si capping layer and 40-pair Mo/Si for reflective layer. Designed defect was attached to L&S pattern. Defect repair region was evaluated by wafer print test using high NA small field EUV exposure tool (HiNA set3).

This work was supported by NEDO. HiNA set-3 projection optics was developed and provided by Nikon Corporation.