Focusing on nanoparticles-based photomultiplier in n-CARS

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ABSTRACT

- In the progress of marking few atom thick patterns down to sub-12 nm features, it is very important that photoresist materials should possess low line edge roughness (LER) and high sensitivity (Eg) for extreme ultraviolet (EUV) and its analogues exposure systems.
- Here we present the metallic nanoparticle photo-multiplier (high optical density materials for λ ~13.5 nm) embedded with n-CARS for better photoabsorption.
- The enhancement in UV absorption due to Ag-NPs suggest a significant contribution of Ag-NPs.
- To investigate the high-resolution patterning synthesized photoresist was exposed to e-beam (E(e)) and Helium ion (E(H)) beam lithography with the sensitivity of 172 μC/cm² and 50.4 μC/cm² for E(e) and E(H), respectively.

RESIST SYNTHESIS

- Stable silver nano-particles were synthesized by a phase-transfer reaction of silver ions with 1-dodecanethiol as a capping agent.
- Silver nano-particles were blended with MAPDST at room temperature and under a nitrogen atmosphere.
- The synthesis was executed with a 36 vol% of silver nano-particles and 64 vol% of MAPDST in acetonitrile solution.

RESULTS

- The developed resist can easily be patterned to sub-15 nm (L/10S to L/S) features at He⁺ dose ~50.6 μC/cm².
- The resist showed acceptable LER 3σ parameters for 15 nm features as 2.12 ± 0.5 nm.
- The embedded with Ag is a potential candidate for sensitivity enhancer as it provide the stable solution for shelf life more than 1 year.

REFERENCES


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