

Low-energy electron exposure of trinuclear tin complex EUV resist

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Extreme ultraviolet lithography (EUVL) is the state of the art in lithography, capable of projecting sub-10nm features onto photoresists. EUVL produces a low photon flux of high-energy photons (13.5nm/91.7eV), which creates a significant secondary electron (SE) cascade within the resist. This leads to stochastic effects, specifically photon shot noise and an isotropic SE blur around the photon absorption sites. The SE blur and photon shot noise are key factors in EUVL; both play an important role in the resolution, line-edge roughness, and sensitivity (RLS) trade off. It is the SEs that are responsible for the solubility switch of the resist; their distribution throughout the resist is what matters in the end. Our research aims to better understand the role of the SEs and investigates ways of manipulating them. For this, LEEM is used as a controlled exposure platform to vary both dose and landing energy, like in our previous work [1,2]. Our current investigation extends this approach to a trinuclear tin complex (TTC) resist, an EUV resist developed at Korea University [3]. Our research program works towards an electric field application to manipulate the SE blur anisotropically to further optimize the RLS metrics. Here we show results of LEEM exposure on TTC without field application, where TTC was exposed to a matrix of dwell spots and subsequently analyzed with AFM. This provides us with the baseline for future experiments on EUV resists with an electric field applied.

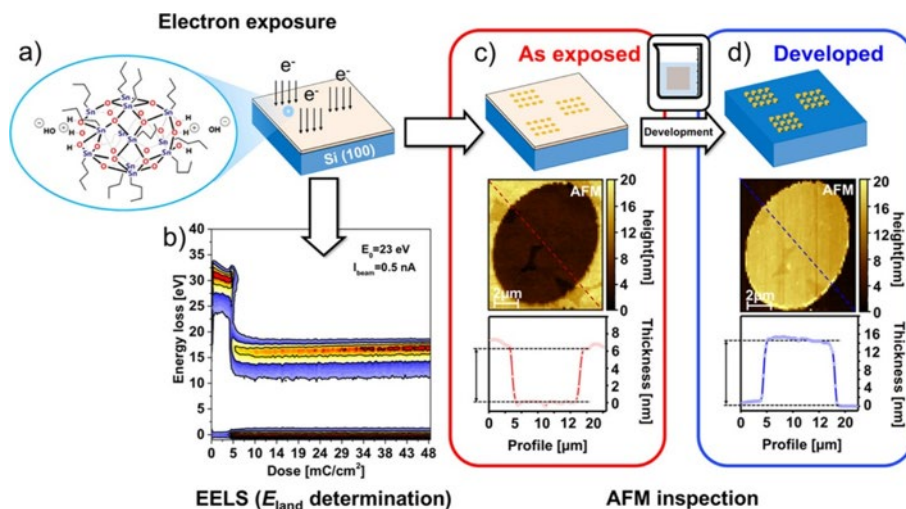


Figure 1. (a) TinOH MOR. (b) EELS spectrum. (c,d) Post-exposure and post-development AFM images of a dwell spot. Figure 1 from reference showing key experimental steps [2].

References

- [1] Aniket Thete., et al., Proc. of SPIE, 9422, 94220A (2015).
- [2] Ivan Bespalov, et al., ACS Appl. Mater. Interfaces, 12, 9881-9889 (2020)
- [3] Gayoung Lim, et al., ACS Mater. Au, 4, 468-478 (2024)