Plasma focused ion beam species effects in cross-sectional metrology of EBL resist sidewall profiles

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Electron beam resist sidewall profiles play an important role in device fabrication; an overcut or vertical profile is commonly used as an etch mask, while an undercut profile is necessary in a metal lift-off process. As such, metrology of resist sidewall profiles is often necessary, however cross-sectional imaging of resist profiles can be challenging when using focused gallium ion beams due to artifacts such as curtaining. Recent work has shown promise of using non-gallium FIB for the characterization of soft materials such as biological samples[1, 2] and polypropylene polymers.[3] Here we investigate the effects of using alternate ion species in a plasma focused ion beam (PFIB) on cut face quality and subsequent resist profile metrology. Specifically, we report results from cross-sectioning studies of exposed e-beam resists using different ion species (Xe, Ar, O, N) for coarse milling and polishing to determine the effects of ion species on cut face quality, pattern fidelity, and resist damage/distortion.

[1] C. Berger, Nat. Commun 14, 629 (2023)

[2] J. Wang, Sci Rep 11, 13162 (2021)

[3] NTH. Farr, Polymers 15, 3247 (2023)