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Advanced resist testing using the Berkeley extreme ultraviolet microfield exposure tool

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Operating as a SEMATECH resist test center, the Berkeley 0.3-NA extreme ultraviolet (EUV) microfield exposure tool continues to play a crucial role in the advancement of EUV resists and masks. The Berkeley tool is equipped with a unique programmable coherence illuminator enabling the tool to efficiently operate at k_1 factors as low as 0.25. At such a setting the tool is ultimately capable of down to 12-nm resolution, however, EUV printing is currently resist limited. Here we present some of the latest printing results demonstrating dense line printing down to 28 nm and semi-isolated line printing down to 22.7 nm. In addition to resist printing results, we also present a variety of resist characterization metrics applying these metrics to the comparison of advanced EUV resists and processes.

For obvious reasons, relevant comparisons of resists requires tool stability. In the past lithographic characterization of the aberrations in the Berkeley tool have been presented.[1,2] Here we further present new aberration measurement results demonstrating the long-term stability of the exposure tool and summarize recent upgrades to such systems as dose and illumination control.

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References

1. P. Naulleau, J. Cain, K. Goldberg, “Lithographic characterization of the field dependent astigmatism and alignment stability of a 0.3 numerical aperture EUV microfield optic,” J. Vac. Sci. & Technol. B **23**, 2003-2006 (2005).
2. P. Naulleau, J. Cain, K. Goldberg, “Lithographic characterization of the spherical error in an EUV optic using a programmable pupil fill illuminator,” Appl. Opt. **45**, 1957-1963 (2005).

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