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Toshiro Itani
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Introduction

The International Conference on Extreme Ultraviolet Lithography (EUVL) was organized this year by JSAP (the Japan Society of Applied Physics), Eureka / LBNL (Lawrence Berkeley National Laboratory), imec, and SPIE and held 15–19 September 2019, in Monterey, California (United States).

For the third year, this conference was co-organized with the Photomask conference (PM) and was well attended. More than 587 attendees participated in the sessions which were divided into joint sessions and individual sessions for EUVL and PM.

At the end of the conference, the EUVL Symposium Steering Committee jointly discussed the community's progress in the focus areas identified in 2018 and formulated focus areas for EUVL extendibility with high numerical aperture (NA), towards 2020.

This year, semiconductor device manufacturers announced the application of EUVL to their 7-nm process technologies indicating the long-awaited insertion of EUVL into high volume manufacturing. This was made possible through the steady progress in EUV scanner power and stability, advances in patterning materials, improvements in cleaner EUV scanner environments, and availability of first-generation pellicles. Also of note, the full suite of actinic EUV mask tools is now available: defect review, blank inspection, and pattern inspection.

For EUVL extendibility into future nodes with high numerical aperture (NA), attention to various focus areas was identified. Focus area one is the availability of high-resolution patterning materials and mitigation of stochastics (which lead to roughness and failures or defects). To achieve this, it was agreed that new materials and inventions are necessary. Focus area two is how to keep EUV masks defect free. Pellicles are being considered as a solution, but improvements in pellicle material lifetime and transmittance need to be pursued. Focus area three is the extension of EUV mask infrastructure for application in high NA. It was emphasized that alternative mask absorber materials will be a significant key for extendibility. Finally, focus area four is on EUV scanner systems and power efficiency. Evidence of higher EUV source power has been demonstrated so it is now a question of how to deliver this with maximum efficiency when applied to high NA.

In summary, 2019 marked a tremendous milestone for EUVL. Nevertheless, much work remains to be done to ensure the long-term extendibility of the technology. The next International Conference on EUVL is planned 20–24 September 2020 in Monterey, California (United States) and will again be co-organized with the PM conference.

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