The Lithographic Benefit and Technical Issue of Shortening the Wavelength of EUVL

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EUV lithography started to use from 2019 for the production of logic devices of 7 nm+ node. It takes about 30 years to realize the usage of EUV Lithography. Since wavelength of 13.5 nm requires the reflective type of optics and mask, Mo/Si multilayers is used for the reflection layer. Thus, in early stage it was seemed that the EUV lithography was very difficult to use for the production.

Now days, EUV lithography is necessary for the advanced and high-performance logic and memory devices for the AI data center and HPC. The cost of High NA and Hyper NA EUVL is increasing. In the case of Hyper NA, DoF is too small for the resist to satisfy the LWR less than 1 nm. Therefore, shortening the wavelength less than 13.5 nm is considered. The benefit and capability of realization of shortening the wavelength (7 – 3 nm) will be discussed from the view point of the MLs, resist, and so on.

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Takeo Watanabe is Project Professor and Principal Investigator of Next Generation EUVL Research Endowed Chair, Laboratory of Advanced Science and Technology for Industry, University of Hyogo. He is an expert of the EUV lithographic technology, including optics, exposure tool, mask and resist related technologies. He has authored over 270 technical papers, and he is the president of the International Conference of Photopolymer Science and Technology (ICPST). He is also Conference Chair of the International Conference of Photomask Japan (PMJ). And he is a program committee member of the International Conference on Electron, Ion, and Photon Beam Technology and Nanofabrication (EIPBN). Furthermore, he is a committee member of lithography of IRDS. He received Executive Science Award from Hyogo Prefecture for his long-time contribution for the research of EUVL technology in December, 2024.