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Kyushu University's Latest Initiatives in EUV Light Source Development for Semiconductor Technology

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We report on new EUV (Extreme Ultraviolet) research activities at Kyushu University in Japan.

The first topic is the establishment of a new EUV exposure research center, named "EUV Photon Co." This organization aims to support materials development for the EUV lithography industry, including photoresists, photomasks, and related technologies. The center is equipped with an EUV light source, an exposure optical system, and a vacuum chamber system for EUV exposure experiments (Fig. 1).

The second topic focuses on the dynamics of Sn plasma, which plays a critical role in EUV emission. We have investigated this using Thomson Scattering (TS) measurements. Last year, our group reported the possibility of achieving a 10% conversion efficiency based on both simulations and experiments. These findings indicate that there is still significant potential to further increase EUV output power and conversion efficiency in the near future.

The third topic is a new high-power EUV source development program currently being prepared at Kyushu University. Since 2003, we have been collaborating with Gigaphoton on EUV source research. We are pioneers in using pulsed CO_2 lasers with Sn droplets, and have applied dual-wavelength picosecond laser pulses for droplet irradiation as well as magnetic fields for debris mitigation. In collaboration with Gigaphoton and Mitsubishi Electric, we have demonstrated high average EUV power exceeding 300 W using a CO_2 laser with output power over 27 kW.

Starting in April 2025, we will launch a new EUV LPP (Laser Produced Plasma) light source development program in collaboration with RIKEN and several other universities.

At the conference, we will present our latest research results and future plans aimed at realizing next-generation high-power EUV sources..

References

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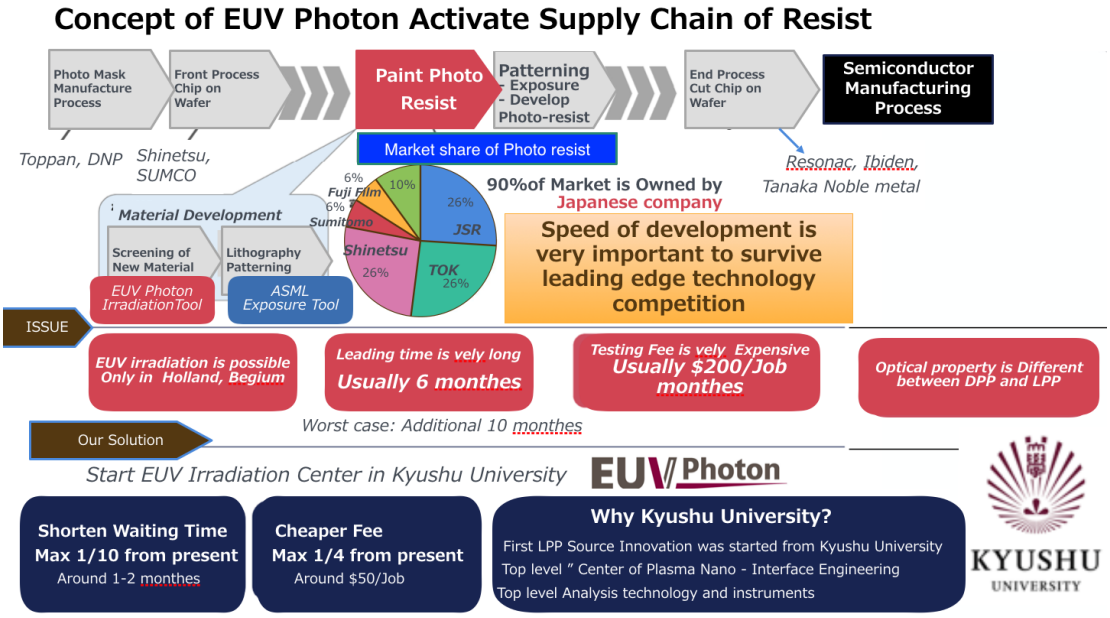

Figure 1. EUV Photon Co.. will support material development of material industry of EUV lithography, for example photo-resist, and photo mask and so on.