Theme: Fundamental technology for semiconductor equipment

- Sub Theme: EUV Source Improvement and Simulation Technology

In laser produced plasma (LPP) type EUV light sources, high power laser pulses ionize and vaporize molten tin (Sn) droplets into a plasma cloud which emits EUV light. The energetic ions (Te ~ 20 eV, ne ~ 10^{19} \text{ cm}^{-3}), radicals, vapor, and debris from the Sn plasma are generated at the impact of the droplets with the high power laser pulses. Optimization of the Sn plasma and contamination control is a crucial task to attain stable EUV power.

With current technology level, the conversion efficiency (CE) is approximately 6%. Improvement of CE is very slowly progressing because phenomena in the EUV source vessel are extremely complicated. In order to optimize the Sn plasma in a EUV source vessel, an accurate modeling of EUV generation under high temperature plasma, particle abundant, and complex flow dynamic environment is necessary. It is anticipated that higher EUV power (better CE) can be attained via numerical approaches that optimize the Sn plasma and factors dominating these phenomena.

Contamination control technique is also an important task for successful industrialization of EUV lithography. Ideal solutions to prevent the contamination include use of mitigation apparatus or in-situ plasma cleaning, yet no researchers have demonstrated industry level solutions to mitigate or to clean the contamination.

In addition, demand for next generation EUV source development is growing. High power stable EUV generation with small equipment footprint is expected to improve productivity in semiconductor chip manufacturing.

This call invites research proposals in this domain, with example topics including the following:

- Modeling of LPP that enables prediction of CE by spatial and temporal distribution of high power laser.
- EUV induced radical/ion/electron generation and particle charging prediction simulation.
- In-situ or ex-situ EUV collector cleaning.
· Mitigation of ion/electron and debris generated in EUV plasma including pellicles.
· Next generation EUV source development for stable, high power, and small footprint equipment

※ The topics are not limited to the above examples and the participants are encouraged to propose original idea.
※ Funding : Up to USD $150,000 per year