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Suppression of ions acceleration in laser produced plasmas for EUV lithography and soft x-ray sources. TATYANA SIZYUK, AHMED HASSANEIN, Purdue University — Development of efficient and bright photon sources emitting in narrow band of EUV or soft x-ray range is of current interests for semiconductor industries as well as for biomedical and nanotechnology applications. Laser produced plasmas (LPP) is currently most feasible way to create compact photon sources. Beside the requirements of high efficiency and power of these sources, prevention and mitigation of damage to collecting optics from energetic plasma ions is critical for device lifetime. We studied the mechanisms affecting ions acceleration in LPP using 3D comprehensive models integrated in HEIGHTS computer package. Our simulation indicated that increasing the pulse width of 2 micrometer laser system interacting with small Sn droplets leads to improvement of EUV source efficiency and significant reduction in the energies of generated ions. Tuning laser pulse duration and temporal laser intensity predicted 3-4 times reduction in ion kinetic energies while the source efficiency continued to improve and saturated at 40 ns (FWHM) laser pulse duration. These results are explained based on the fundamentals of laser interaction with targets and with the evolving plasma. Comparison of ion energies, charges, and fluxes to experimental data are presented.

Tatyana Sizyuk
Purdue University

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