Source of extreme ultraviolet light based on expanding jet of dense plasma supported by microwaves: theory and modelling

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Transition to exposure using the extreme ultraviolet (EUV) radiation is vital for the development of next-generation projection lithography for the semiconductor industry [1]. The only practical method of EUV light generation is based on a line radiation of multiply charged ions considering that stripping causes a shift of the ion emission spectrum towards the shorter wavelengths for highly ionized charge-states. The most successful projects use evaporation of Sn droplets in a focused laser beam [2]. In this paper, inspired by the success of recent experiments in the Institute of Applied Physics [3, 4], we discuss a new advantageous concept of EUV light sources, based on the expanding jet of dense plasma of heavy noble gases (Xe, Ar) supported by high-power microwaves. Basing on a quasi-one-dimensional theory of plasma flows with varying charge-state composition [5, 6], we develop a numerical model of the EUV radiating jet [7]. The results of modelling are used for the analysis of recent experimental data and exploration of physical constraints for next generation devices.

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