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Influence of pressure on ion energy distribution functions in EUV-induced hydrogen plasmas T.H.M. VAN DE VEN, P. REEFMAN, Eindhoven University of Technology, C.A. DE MEIJERE, ASML, V.Y. BANINE, Eindhoven University of Technology and ASML, J. BECKERS, Eindhoven University of Technology — Next-generation lithography tools currently use Extreme Ultraviolet (EUV) radiation to create even smaller features on computer chips. The high energy photons (92 eV) induce a plasma in the low pressure background gas by photoionization. Industries have realized that these plasmas are of significant importance with respect to machine lifetime because impacting ions affect exposed surfaces. The mass resolved ion energy distribution function (IEDF) is therefore one of the main plasma parameters of interest. In this research an ion mass spectrometer is used to investigate IEDFs of ions impacting on surfaces in EUV-induced plasmas. EUV radiation is focused into a vessel with a low pressure hydrogen environment. Here, photoionization creates free electrons with energies up to 76 eV, which further ionize the background gas. The influence of the pressure on plasma composition and IEDFs has been investigated in the range 0.1-10 Pa. In general the ion fluxes towards the surface increase with pressure. However, above 5 Pa the flux of H_2^+ is not affected by the increase in pressure due to the balance between the creation of H_2^+ and the conversion of H_2^+ to H_3^+. These results will be used to benchmark plasma scaling models and verify numerical simulations.

T.H.M. van de Ven
Eindhoven University of Technology

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