First characterization of ion fluxes in repetitively pulsed hydrogen plasma induced by 13.5 nm EUV radiation at the EBL2 facility

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The current paper describes the properties of 13.5 nm extreme ultraviolet (EUV) radiation induced hydrogen plasma in the exposure chamber of the new EUV beam line (EBL2) at TNO. The introduction of higher source powers in EUV lithography systems causes increased risks for contamination and degradation of EUV photomasks and pellicles. Appropriate testing can help to make an inventory and mitigate these risks. To understand the influence of plasma produced due to gas photoionization on tooling and components, a more detailed description of such plasma is required. In EBL2 samples (including EUV photomasks) can be exposed to EUV radiation in a controlled environment. This allows for a systematic parameter study of EUV plasma. 3 kHz repetitively pulsed plasma conditions are characterized with compact a retarding field ion energy spectrometer, measuring time and space resolved ion flux and ion energy profiles on the chamber walls. Plasma profiles as a function of gas pressure, beam and chamber geometry, as well as plasma decay times are discussed.