Analysis of improvement potential of electrodeless discharge EUV light source for metrology

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EUV metrology light sources based on dynamic Z-pinch in inductively coupled plasmas compare favorably to other discharge configurations with electrodes in terms of low debris generation, high source stability, power and brightness. For very reliable and stable 24/7-operation with high brightness, e.g., in future second-generation mask metrology tools, additional source improvements are required to reach central bore lifetimes above 10 Giga-pulses and to meet brightness requirements approaching 100 W/mm2sr.
The improvement potential of an electrodeless xenon-based discharge source for EUV light at 13.5 nm or 10.9 nm is analyzed in detail with particular emphasis on debris reduction at the bore carrier and brightness increase of the plasma column by conversion of deposited energy. New features are described, including reduction of radiation self-absorption by use of He buffer gas and reduction of bore erosion by plasma guiding by an intrinsically generated external axial magnetic field.