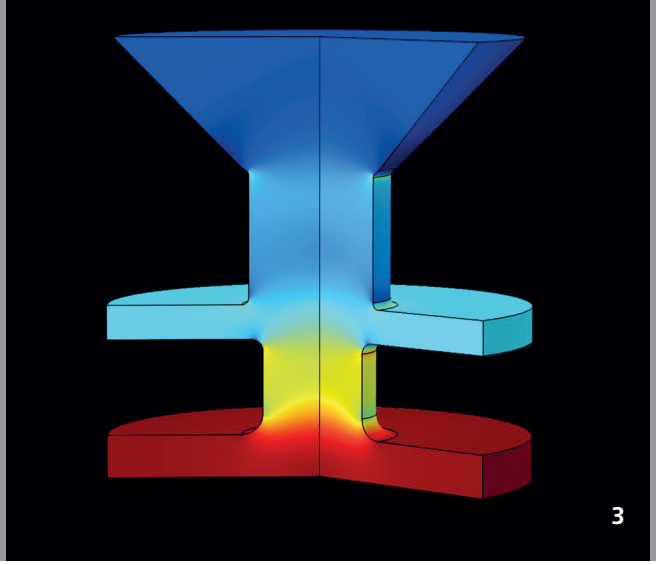

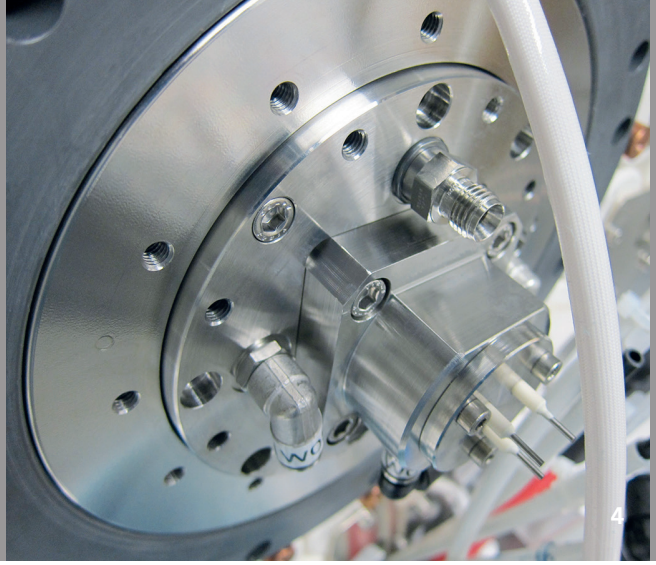

COMPACT RADIATION SOURCE IN THE EXTREME ULTRAVIOLET

Task

Discharge-based sources of radiation in the extreme ultraviolet are a cost-effective and user-friendly solution, in particular at a wavelength of 13.5 nm, which is of great interest for future chip production. In such sources, dense and hot plasma is generated by a pulsed discharge of electrically stored energy. At Fraunhofer ILT, these sources are being developed and converted into commercial applications. In order to make these sources more attractive to the user and also to open up further fields of application, the institute has focused its development on increasing the source's maintenance interval.

Method

The work presented here is aimed both at reducing the unavoidable erosion of the electrodes by the use of other materials as well as developing an extended range of operating parameters. In particular, a new electrical circuit for igniting the plasma was used to increase the efficiency for the conversion of the electrical energy into EUV radiation. Based on long-term tests and simulations of the flow dynamics of the working gas as well as cooling of the electrode system, an EUV source has been developed which achieves the increased output power at a longer maintenance interval.

Results

The solutions found to improve the performance and the maintenance interval have been developed to market maturity and integrated into the product portfolio. The units at international customers are being retrofitted with the upgrades.

Applications

The radiation source is suitable for various applications in the field of semiconductor lithography, such as the characterization of optics, contamination studies or the development of new photoresists.

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3 FEM simulation of the pressure distribution in the electrode system.

4 Rear side of the EUV radiation source.