Enhanced optical performance of 5.5 sr LPP collector mirror

Hagen Pauer, Marco Perske, Sergiy Yulin, Viatcheslav Nesterenko, Mark Schürmann, Sven Schröder, Markus Trost, David Schmitz, Torsten Feigl, Norbert Kaiser
Fraunhofer-Institut für Angewandte Optik und Feinmechanik, Albert-Einstein-Str. 7, 07745 Jena, Germany

The source output power and lifetime, including the collector optics lifetime, remain the key issues for EUV lithography systems today. In order to meet the challenging EUV pilot source requirements, both the reflectivity and the wavelength matching of the multilayer coated LPP collector mirrors have been enhanced considerably during recent development efforts. A number of 5.5 sr ellipsoidal mirrors with more than 660 mm outer diameter were coated with laterally graded high-reflective multilayers. The multilayer mirror coatings were optimized in terms of high peak reflectivity at 13.5 nm. The measured s-polarized reflectance of the LPP collector mirrors are well above 60 % within the clear aperture resulting in the specified non-polarized reflectance of R > 50 %. Further deposition technology optimization focused on precise wavelength matching. The design wavelength of 13.5 nm is routinely achieved within a wavelength deviation of ± 0.03 nm or less. The multilayer coated collectors collect EUV light with 5.5 sr solid angle thus representing by far the largest EUV multilayer collector mirrors coated to date. The current optical properties of the EUV collector mirrors and ways for future improvements will be discussed in detail.

Topics: Multilayer Coatings / Optics

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