



NANOSTRUCTURING WITH EUV LABORATORY EXPOSURE TOOL (EUV-LET)

Task

Many industrial applications in nanotechnology require a production method that enables the implementation of nanoscale, periodic structures across large areas quickly and cost-efficiently. The development of short-wave radiation sources opens up new solutions in this area.

Method

Gas-discharge based radiation sources for extreme ultraviolet radiation (EUV, $\lambda = 5 \text{ nm} - 15 \text{ nm}$) are used to illuminate transmission masks with nanoscale periodic structures. The fabrication technology for such high-resolution masks is developed in the institute as well. At defined intervals behind the transmission mask self-images are generated. These images are recorded in a photosensitive medium and become visible after a development procedure, comparable to traditional photography. Due to the unique radiation characteristics of the EUV source, it is not only possible to reproduce the mask structure but also to reduce the period of the pattern by a factor of two.

Result

Based on previous investigations at the Fraunhofer ILT an EUV Laboratory Exposure Tool (EUV-LET) was constructed for test-sample sizes up to 100 mm. With the assistance of high-precision positioning and alignment systems, it is possible to monitor the distance between the mask and the surface of test sample with an accuracy of 10 nm. Within an exposure time of approximately one minute, periodic nanostructures are generated over an area of up to 4 mm² on the sample. The demonstrated resolution of the EUV-LET reaches 10 nm. First results validate the potential of the EUV-LET in terms of pattern resolution, flexibility and industrial implementation.

Applications

For a variety of research institutions active in the field of nanotechnology the EUV-LET offers a possibility to generate periodic structures over large areas. This kind of nanostructuring tool also provides an effective solution for the growing nanotechnology market, which is particularly relevant for small and medium-sized enterprises.

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2 EUV-LET station.

3 Cleanroom processing bench.