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Hitachi High-Tech Develops DESIGNGAUGE
Design Data Measurement System

Hitachi High-Technologies Corporation (President: Masaaki Hayashi) has launched DESIGNGAUGE, a mask design data measuring system developed to improve semiconductor device design and development efficiency, and enhance semiconductor device production yield.

The introduction of immersion technology in semiconductor lithography processes has led to the emergence of a generation of devices with 45-nm architecture and smaller. Due to the miniaturization of these devices, it is gradually becoming more difficult to improve device production yields simply by reducing defects caused by foreign substances. This has spurred demand for "design for manufacturability" (DFM), which includes measures to prevent problems by revising the design data.

When exposing and transferring a circuit pattern onto a semiconductor wafer, misalignment may occur between the mask pattern and actual pattern because of light diffraction. To eliminate this misalignment, OPC[*1] correction is performed on the mask, taking proximity effects into account. However, given the very small feature sizes, OPC has become more complex, and defects caused by the mask have become a serious factor inhibiting the improvement of yields.

The newly developed DESIGNGAUGE is a system which collates and compares the mask pattern design data accurately with the circuit pattern's image data on the wafer measured with a CD-SEM[*2]. DESIGNGAUGE can use this design data to create measurement recipes off-line that previously could only be created using a CD-SEM. By remotely controlling the CD-SEM in accordance with the measurement recipe, it is possible to automatically bring together the mask pattern design data with a test pattern transferred onto the wafer, and obtain data for creating the OPC model. The introduction of DESIGNGAUGE greatly streamlines the task of acquiring the enormous amounts of data for creating an OPC model, reducing the time needed to around one fifth of the time required to obtain this data using conventional techniques.

Further improvements in the accuracy of DESIGNGAUGE pattern collation technology and the establishment of new measurement technology utilizing the design data will add still further value to Hitachi High-Tech's CD-SEMs, which command the top share of the world's CD-SEM market. At the same time, to meet metrology needs in leading-edge processes where aggressive development techniques press forward, Hitachi High-Tech is committed to promoting the development of DFM-based measuring technologies and systems.

*1: OPC: Optical proximity correction

*2: CD-SEM: Critical dimension scanning electron microscope for measuring the (critical) dimensions of the fine circuit patterns transferred onto semiconductor wafers.

DESIGNGAUGE Principal Features

1) Offline recipe creation function

By utilizing design data, measurement recipes, which could previously only be created, using CD-SEMs, can now be created off-line without such equipment.

2) Remote control function

The CD-SEM can be remotely controlled by executing the measurement recipe created using DESIGNGAUGE. Bring together and comparing the design data with the semiconductor pattern, this function obtains the SEM image data at the points of measurement specified in the measurement recipe, with the images obtained stored by DESIGNGAUGE.

3) CD measurement function utilizing design data

In addition to the critical dimension measuring function normally offered by CD-SEMs, DESIGNGAUGE also has a function for measuring the difference between the mask pattern design data and the semiconductor pattern dimensions.

4) CD re-measuring function

The CD measuring function can be run again using the SEM images stored by DESIGNGAUGE.

CD-SEM S-9380 II

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