News Release

Hitachi High-Tech

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Hitachi High-Technologies Launches New High-Speed Defect Review SEM CR6300
-Review SEM Featuring Pattern Inspection and Measurement Function through Design Data Comparison Analysis-

Tokyo, Japan, March 8, 2017 – Hitachi High-Technologies Corporation (TSE:8036, Hitachi High-Tech) announced sales launch of a high-speed defect review SEM CR6300. This new system detects and classifies defects generated in the semiconductor manufacturing process and has newly designed electron microscope optics fitted with multiple detectors to enable high sensitivity review of micro-defects using SEM images. Further improvements to the stage control increased speed of operation by three times compared to conventional model. In addition, added functionality to provide characteristics index for process optimization and yield enhancement by comparing the captured defect images with pattern design data.

Manufacturers of cutting-edge logic devices are developing 7 nm generation process technologies and started mass production of 10 nm generation devices. Refinements in logic device structure have driven demand for capture of defects with high capture rate for defects of 5 nm and below, as well as for capture of more images in a shorter time. In memory devices, the observation of defects in the bottom of deep trenches and contact holes with high aspect ratios has become an urgent priority with the use of architecture based on a stack of multiple memory cells arranged vertically. In defect fatality classification based on defect observation images, there is an increasing demand for determination of failure areas that can lead to a chip malfunction and quantification of fine pattern shape changes.

On CR6300, Hitachi High-Tech has adopted a new XY stage and developed an electron beam control system that is linked to the stage movement, enabling a three times increase in the defect image capture performance per time unit compared to conventional technology. Also, the newly developed electron optic system enables capture of six types of SEM images and uses detection technology that is able to select secondary electrons (SE) and backscattered electrons (BSE) from a sample, based on the electrons' emission angle and energy. This detection technology enhances the capture rate of signal electrons emitted from deep trenches and contact holes with high aspect ratios, increasing the visibility of pattern shapes at the bottom.

In addition to the defect review function, this system additionally has a shape evaluation function which calculates and outputs the changes in the pattern shape by comparing design data and actual pattern, which is used to optimize control parameters of process equipments such as lithography and etching equipment.
For the bare wafer review function that plays a critical role in monitoring stable operation of process equipment, the illumination laser light has been strengthened threefold, boosting the defect capture rate with a dark field microscope. In addition, the sensitivity of the X-ray detector in the conventional EDX*[1] has been enhanced, enabling defect analysis to be conducted in a shorter time than before, while the maintenance time has also been reduced by changing the cooling system.

Sales of the new CR6300 SEM will start on March 8. The Hitachi High-Tech Group will continue its aim to "become the Global Top in high-tech solutions," and respond swiftly to the needs of customers and markets, working from the customer's perspective as a fast-moving creator of cutting-edge businesses.

*1 EDX: Energy Dispersive X-ray spectrometry

Review SEM CR6300 External View

Main Features

1. Enhanced defect SEM image capture performance per unit time

1) Approximately three times faster than conventional products: The new XY stage linked with electron beam control enables faster operation

2. Enhanced defect visibility (SEM image quality improvement)

1) Higher resolution images: New electron optics system enables high resolution imaging of micro-defects
2) Enhanced visibility of the bottom of deep trenches: The system selects the optimal signal electrons in terms of SEs or BSEs, emission angle, and energy level, blending them to enhance the visibility of defects at the bottom of deep trenches or holes
3) Six types of SEM images: Six detectors positioned on the periphery of the defect increase the defect capture rate during automatic reviews using contour, profile and material information

3. Pattern design data comparison analysis function

1) Determination of defect coordinates: Provides device defect judgment information based on defect position information by collating with design data
2) Characteristics Index: Comparison of defect pattern contour and design data enables characterization of pattern shape change

4. Enhanced defect classification performance

1) Enhanced classification accuracy: System enhances ADC purity due to higher throughput that enables increase of captured defects amount
2) Addition of classification index: Classification performance enhanced with the provision of new classification index enabled by six types of defect SEM images

5. New EDX element analysis system

1) The detection capabilities of the special X-ray detector have been enhanced to enable faster element analysis than conventional products
2) A low-maintenance cooling mechanism using a Peltier device reduces the maintenance burden

6. Unpattern wafer review

1) A high output laser light source and new dark field microscope increased the micro-defect capture rate for 7 nm generation chips
2) Using the result file from the optical inspection equipment enables total automation from capture of defect SEM images to element analysis

7. Overlay measurement

1) Overlay measurement mode has been added in the defect inspection mode
2) Device patterns can be measured directly within the chip without using a dedicated metrology structures

Main Specifications

Wafer Size	Φ300mm (SEMI standard V notched wafer)
Auto-loader	2FOUP*2 compatible random access
Power Supply	Single Phase AC200V, 208V, 230V, 12kVA(50/60Hz)

*2 FOUP (Front-Opening Unified Pod: A standard front-opening cassette integrated transport and storage container used in semiconductor plants

Contact

Koji Arai, Yutaka Okagawa
Process Control Systems Dept. 2nd.
Semiconductor Process Control Systems Div.
Electronic Device Science Systems Business Group
Tel: +81-50-3139-4726

For Media Inquiries

Shota Sano, Aiko Matsumoto
Corporate Communications Dept., CSR Div.
E-mail: shota.sano.wv@hitachi-hightech.com
Tel:+81-3-3504-3933