

CLAIMS

1. A data-driven misregistration parameter configuration and measurement method comprising:
- 5 simulating a plurality of measurement simulations of at least one multilayered semiconductor device, selected from a batch of multilayered semiconductor devices intended to be identical, using a plurality of sets of measurement parameter configurations, thereby generating simulation data for said at least one multilayered semiconductor device;
- 10 identifying at least one set of recommended measurement parameter configurations, which is selected from said plurality of sets of measurement parameter configurations;
- providing a multilayered semiconductor device selected from said batch of multilayered semiconductor devices;
- 15 providing said at least one recommended set of measurement parameter configurations to a misregistration metrology tool having multiple possible sets of measurement parameter configurations;
- measuring at least one multilayered semiconductor device, selected from said batch of multilayered semiconductor devices intended to be identical, using
- 20 said at least one recommended set of measurement parameter configurations, thereby generating measurement data for said at least one multilayered semiconductor device;
- thereafter identifying a final recommended set of measurement parameter configurations; and
- measuring misregistration of at least one multilayered semiconductor
- 25 device, selected from said batch of multilayered semiconductor devices intended to be identical, using said final recommended set of measurement parameter configurations.
2. A data-driven misregistration parameter configuration and measurement method according to claim 1 and wherein said final recommended set of measurement
- 30 parameter configurations is identified based on best results of said measurement data for said at least one multilayered semiconductor device.

3. A data-driven misregistration parameter configuration and measurement method according to claim 1 or claim 2 and wherein said plurality of measurement simulations are metrology target design simulations.
- 5 4. A data-driven misregistration parameter configuration and measurement method according to claim 3 and wherein said at least one recommended set of measurement parameter configurations is identified based on at least one of:
- 10 inaccuracy;
Qmerit;
focus sensitivity;
throughput; and
contrast precision.
- 15 5. A data-driven misregistration parameter configuration and measurement method according to any of claims 1 – 4 and wherein said sets of measurement parameter configurations comprise at least one of:
- 20 an axis along which misregistration is measured;
a region of interest of a metrology target;
a numerical aperture used in misregistration measurement;
a polarization of light used in misregistration measurement;
wavelengths of light used in misregistration measurement;
bandwidth of wavelengths of light used in misregistration measurement;
an intensity of light used in misregistration measurement;
25 a focal depth used in misregistration measurement; and
an apodizer used in misregistration measurement.
- 30 6. A data-driven misregistration parameter configuration and measurement method according to any of claims 1 – 5 and wherein said misregistration metrology tool is an imaging misregistration metrology tool.

7. A data-driven misregistration parameter configuration and measurement method according to any of claims 1 – 5 and wherein said misregistration metrology tool is a scatterometry misregistration metrology tool.
- 5 8. A data-driven misregistration parameter configuration and measurement method according to any of claims 1 – 7 and also comprising:
generating simulation signal data; and
comparing said simulation signal data to said measurement data for said
at least one multilayered semiconductor device.
- 10 9. A data-driven misregistration parameter configuration and measurement method according to claim 8 and wherein said simulation signal data includes at least one of:
contrast;
15 sensitivity; and
pupil image.
10. A data-driven misregistration parameter configuration and measurement method according to claim 8 or claim 9 and also comprising:
20 indicating for which of said sets of measurement parameter configurations and for which portions of said multilayered semiconductor device a mismatch between said simulation signal data and said measurement data occurs; and
indicating possible root causes of said mismatch.
- 25 11. A data-driven misregistration parameter configuration and measurement system comprising:
a semiconductor device measurement simulator, operative to simulate
a plurality of measurement simulations of at least one multilayered semiconductor device,
selected from a batch of multilayered semiconductor devices intended to be identical,
30 using a plurality of sets of measurement parameter configurations, thereby generating
simulation data for said at least one multilayered semiconductor device;

a simulation data analyzer, operative to identify at least one recommended set of measurement parameter configurations, which is selected from said plurality of sets of measurement parameter configurations; and

5 a misregistration metrology tool having multiple possible sets of measurement parameter configurations, operative to receive said at least one recommended set of measurement parameter configurations and to measure misregistration of at least one multilayered semiconductor device, selected from said batch of multilayered semiconductor devices intended to be identical, using said at least one recommended set of measurement parameter configurations, thereby generating
10 measurement data for said at least one multilayered semiconductor device.

12. A data-driven misregistration parameter configuration and measurement system according to claim 11 and wherein said semiconductor device measurement simulator is a metrology target design simulator.

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13. A data-driven misregistration parameter configuration and measurement system according to claim 12 and wherein said at least one recommended set of measurement parameter configurations is identified based on at least one of:

inaccuracy;
20 Qmerit;
focus sensitivity;
throughput; and
contrast precision.

25 14. A data-driven misregistration parameter configuration and measurement system according to any of claims 11 – 13 and wherein said sets of measurement parameter configurations comprise at least one of:

an axis along which misregistration is measured;
a region of interest of a metrology target;
30 a numerical aperture used in misregistration measurement;
a polarization of light used in misregistration measurement;
wavelengths of light used in misregistration measurement;

bandwidth of wavelengths of light used in misregistration measurement;

an intensity of light used in misregistration measurement;

a focal depth used in misregistration measurement; and

5 an apodizer used in misregistration measurement.

15. A data-driven misregistration parameter configuration and measurement system according to any of claims 11 – 14 and wherein said misregistration metrology tool is an imaging misregistration metrology tool.

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16. A data-driven misregistration parameter configuration and measurement system according to any of claims 11 – 14 and wherein said misregistration metrology tool is a scatterometry misregistration metrology tool.

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17. A data-driven misregistration parameter configuration and measurement system according to any of claims 11 – 16 and wherein said simulation data analyzer is further operative to compare said simulation data to said measurement data.

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20 A data-driven misregistration parameter configuration and measurement system according to claim 17 and wherein said simulation signal data includes at least one of:

contrast;

sensitivity; and

pupil image.

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19. A data-driven misregistration parameter configuration and measurement system according to claim 17 or claim 18 and wherein said simulation data analyzer is further operative to:

30 indicate for which of said sets of measurement parameter configurations and for which portions of said multilayered semiconductor device a mismatch between said simulation signal data and said measurement data occurs; and indicate possible root causes of said mismatch.