CLAIMS

Claim 1: A method for inspection recipe generation for automated inspection of semiconductor devices, comprising at least one of the following groups of steps based on an initial condition:

when creating an initial recipe:

using a reference data set for inspection recipe generation;

running automatic inspection with the initial recipe on captured images of dies of the reference data set with an inspection system;

classifying the detected inspection results from the automatic inspection and comparing the classified inspection results with an expert classification of defects in dies;

generating overkill and underkill numbers; and

modifying inspection recipe parameters and repeating the automatic inspection if the detection and/or the classification of a test data set is below a predefined threshold using saved images of dies to iteratively improve the inspection recipe parameters for use in future semiconductor device production; or,

when starting with the initial inspection recipe and a knowledge database of dies is not large enough:

using a reference data set for inspection recipe generation;

running automatic inspection with the initial recipe to capture images of dies of a new semiconductor device loaded into the inspection system;

classifying the detected inspection results from the automatic inspection and comparing the classified inspection results with the expert classification of defects in dies;

generating overkill and underkill numbers; and

modifying inspection recipe parameters and repeating the automatic inspection if the detection and/or the classification of the test data set is below the predefined threshold using saved images of dies to iteratively improve the inspection recipe parameters for use in future semiconductor device production.

Claim 2: The method of claim 1, wherein the reference data set is a stored reference map or a tune map which is uploaded to a computer.

Claim 3: The method of claim 2, wherein a refining, tuning and modifying of the existing reference map or the existing tune map is carried out prior to the upload to the computer.

Claim 4: The method of claim 1, wherein the existing inspection recipe is stored and is uploaded to a computer.

Claim 5: The method of claim 4, wherein a refining, tuning and modifying of the existing initial inspection recipe is carried out prior to the upload to the computer.

Claim 6: The method of claim 1, wherein the tune map contains dies of interest and a die classification is selectable by the user.

Claim 7: The method of claim 6, wherein dies from different semiconductor devices are assed to the tune map.

Claim 8: The method of claim 1 wherein a classification table shows comparison results between the reference data set and the test data set, wherein the test data set is a test map.

Claim 9: The method of claim 1, wherein prior to using the reference data set for inspection recipe generation, the generation of the data set and of the initial recipe comprise the steps of:

loading a semiconductor device into an inspection system;

performing a setup and a tune alignment;

inspecting the semiconductor device with the inspection system;

classifying dies on the semiconductor devices; and

adding die images and defect information to a tune map

Claim 10: The method of claim 9, wherein a new semiconductor device is loaded into the inspection system if a knowledge database of dies of the tune map is not large enough and automatic inspection of the newly loaded semiconductor device is carried out.

Claim 11: A computer system for inspection recipe generation for automated inspection of semiconductor devices comprising:

an inspection system arranged to capture images of dies on one or more wafers;

a computer arranged to use a reference data set for inspection recipe generation and run an automatic inspection with an initial recipe on the images of dies of the reference data set;

a dialog, with a first window showing at least the reference data, a second window showing at least test data; a third window showing a tune map and a fourth window showing a classification table which enables a comparison between the classified inspection results and an expert classification of defects in dies, with regard to the overkill and underkill numbers, wherein the computer is arranged to perform a generation and display of overkill and underkill numbers, and to modify inspection recipe parameters and repeat the automatic inspection if the detection and/or the classification of a test data set is below a predefined threshold using saved images of dies to iteratively improve the inspection recipe parameters for use in future semiconductor device production.

Claim 12: The computer system of claim 11, wherein the reference data set is a stored reference map or a tune map which is uploaded to the computer.

Claim 13: The computer system of claim 12, wherein a refining, tuning and modifying of the existing reference map or the existing tune map is carried out prior to the upload to the computer.

Claim 14: The computer system of claim 11, wherein the existing inspection recipe is stored and is uploaded to the computer system.

Claim 15: The computer system of claim 14, wherein a refining, tuning and modifying of the existing initial inspection recipe is carried out prior to the upload to the computer.

Claim 16: The computer system of claim 11, wherein tune map contains dies of interest and a die classification is selectable by the user via the dialog.

Claim 17: The computer system of claim 16 wherein dies from different semiconductor devices are assed to the tune map and displayed in the third window of the dialog.

Claim 18: The computer system of claim 11, wherein a classification table of the fourth shows comparison results between the reference data set and a test data set, wherein the test data set is the test map.

Claim 19: The computer system of claim 11, wherein the inspection system is connected to the computer system and the inspection system is used to run automatic inspection of a loaded semiconductor device.

Claim 20: The computer system for inspection recipe generation for automated inspection of semiconductor devices of Claim 11, wherein a new semiconductor device is loaded into the inspection system if a knowledge database of dies is not large enough and automatic inspection of the newly loaded semiconductor device is carried out and the new images are added to the knowledge database.

Claim 21: An apparatus for inspection recipe generation for automated inspection of semiconductor devices comprising:

an inspection system, comprising:

an incident light illumination system;

a camera arranged to receive light from a surface of the semiconductor devices, wherein the light is converted to electric image data for further analysis;

a computer arranged to use a reference data set for inspection recipe generation and run an automatic inspection with an initial recipe on images of dies of the reference data set, in order to modify inspection recipe parameters by iteratively improving the inspection recipe parameters of a test data set using saved images of dies for use in future semiconductor device production; and

at least one display, which is subdivided into a first window, a second window, a third window and a fourth window; wherein the first window showing at least the reference data, the second window showing at least test data; the third window showing a tune map and the fourth window showing a classification table which enables a comparison between images of the classified inspection results and images of an expert classification of defects, with regard to the overkill and underkill numbers which are generated and displayed.

Claim 22: The apparatus of claim 21, wherein an input device enables a modification of the inspection recipe parameters and repeating the automatic inspection if the detection and/or the classification is below a predefined threshold.

Claim 23: The apparatus of claim 22, wherein the reference data set is a stored reference map or a tune map which is uploaded to the computer; a refining, tuning and modifying of the reference map or the tune map is carried out prior to the upload to the computer.

Claim 24: The apparatus of claim 21, wherein the existing inspection recipe is stored and is uploaded to the computer, wherein a refining, tuning and modifying of the existing initial inspection recipe is carried out prior to the upload to the computer.

Claim 25: The apparatus for inspection recipe generation for automated inspection of semiconductor devices of Claim 21, wherein a new semiconductor device is loaded into the inspection system if a knowledge database of dies is not large enough and automatic inspection of the newly loaded semiconductor device is carried out and the new images are added to the knowledge database.