

RECIPE CREATION METHOD, SEMICONDUCTOR DEVICE MANUFACTURING METHOD, SUBSTRATE PROCESSING APPARATUS, AND RECIPE CREATION PROGRAM

TECHNICAL FIELD

[0001] The present disclosure relates to a recipe creation method, a substrate processing apparatus, a recipe creation program, and a semiconductor device manufacturing method.

BACKGROUND

[0002] In a substrate processing apparatus such as a film-forming apparatus or the like, a process gas may be supplied to and heated in a process chamber, a pressure and a temperature in the process chamber may be set to predetermined values, and various processes may be performed on a surface of a substrate. When a thin film formation process is performed on a substrate in a substrate processing apparatus, a recipe is created to set process conditions.

[0003] In order to perform a desired process on a product substrate, it is necessary to create an optimum recipe. For example, in the related art, there is known a method of efficiently creating a recipe using common use parameters. Furthermore, for example, in the related art, there is known a technique in which when a recipe editing screen is displayed and a recipe is created, a designated step number is designated and parameters necessary in each step are copied.

[0004] However, it may be difficult to grasp changes from steps before and after a certain step while the certain step is being edited, and thus, there may be a concern that the work efficiency in recipe editing decreases and editing errors occur. Furthermore, for a problem that if all the settable items are displayed, it is difficult to know which item is set at first glance, it is preferable to perform editing while grasping the entire recipe and to check only the set items.

[Prior Art Documents]

[0005] Patent Documents

Patent Document 1: Japanese Patent Application Laid-open No. 2000-133595

SUMMARY

[0006] Some embodiments of the present disclosure provide a technique that makes it possible to perform recipe editing with significantly improved operability by improving a recipe editing function.

[0007] According to one embodiment of the present disclosure, there is provided a technique that includes: displaying, on a display, a recipe editing screen including at least a selection screen area that displays a parameter list for selection of parameters included in a recipe of a substrate processing apparatus, and a parameter editing screen area that edits the parameters; receiving a selection operation that selects an editing target parameter from the parameter list displayed on the selection screen area; displaying, on the parameter editing screen area, in an editable manner, a timing chart that is changeable at a time of each process included in a substrate processing process; and editing the editing target parameter by receiving an operation instruction to edit the timing chart displayed on the parameter editing screen area and changing the timing chart according to the operation instruction.

[0008] As used herein, the term "recipe" refers to a record of process conditions for a substrate such as a combination of commands, settings, and parameters for a substrate processing apparatus.

BRIEF DESCRIPTION OF DRAWINGS

[0009] The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate embodiments of the present disclosure.

[0010] FIG. 1 is a perspective view of a substrate processing apparatus according to an embodiment of the present disclosure.

[0011] FIG. 2 is a side perspective view of the substrate processing apparatus according to the embodiment of the present disclosure.

[0012] FIG. 3 shows a configuration example of a controller and a storage of the substrate

film, an oxide film, a nitride film, a metal-containing film and the like.

[0137] According to the present disclosure in some embodiments, it is possible to improve the efficiency of an editing work on a recipe editing screen and to reduce editing errors.

[0138] While certain embodiments have been described, these embodiments have been presented by way of example, and are not intended to limit the scope of the disclosures. Furthermore, various omissions, substitutions and changes in the form of the embodiments described herein may be made without departing from the spirit of the disclosures.

[0139] T: timing chart

10: controller

11: main controller

20: storage

31: operator

32: display

41: screen displaying part

42: parameter receiving part

43: parameter displaying part

45: parameter editing part

46: step editing part

47: consistency check part

48: execution part

100: substrate processing apparatus

200: wafer

WHAT IS CLAIMED IS:

1. A recipe creation method, comprising:
 - displaying, on a display, a recipe editing screen including at least a selection screen area that displays a parameter list for selection of parameters included in a recipe of a substrate processing apparatus, and a parameter editing screen area that edits the parameters;
 - receiving a selection operation that selects an editing target parameter from the parameter list displayed on the selection screen area;
 - displaying, on the parameter editing screen area, in an editable manner, a timing chart that is changeable at a time of each process included in a substrate processing process; and
 - editing the editing target parameter by receiving an operation instruction to edit the timing chart displayed on the parameter editing screen area and changing the timing chart according to the operation instruction.
2. The method of Claim 1, wherein the editing target parameter indicates a target value to be targeted in the substrate processing process performed by the substrate processing apparatus, and a time at which the target value is reached,
 - wherein the timing chart indicates a change in the target value at the time of each process,
 - wherein the operation instruction is an instruction to move a point on the timing chart displayed in the parameter editing screen area, and
 - wherein in the act of editing the editing target parameter, the target value of a parameter, which corresponds to the timing chart where the instruction to move the point is given, at a time corresponding to the point is changed from a target value represented by a point before the movement to a target value represented by a point after the movement.
3. The method of Claim 1, wherein the editing target parameter indicates a time at which a state of a component of the substrate processing apparatus is turned on or off,

wherein the timing chart indicates whether the state of the component is on or off at the time of each process,

wherein the operation instruction is an instruction to switch the state at a point on the timing chart between off and on by indicating the point on the timing chart displayed on the parameter editing screen area, and

wherein in the act of editing the editing target parameter, the editing target parameter corresponding to the timing chart is edited by changing the state at a time corresponding to the point to a state according to the operation instruction.

4. The method of Claim 1, wherein the operation instruction is an instruction to change a display order of the timing chart displayed on the parameter editing screen area, and

wherein in the act of displaying the timing chart, the display order of the timing chart is changed according to an instruction to change the display order of the editing target parameter corresponding to the timing chart.

5. The method of Claim 1, wherein the operation instruction is an instruction to hide the timing chart displayed on the parameter editing screen area, and

wherein in the act of displaying the timing chart, the timing chart to which the instruction to hide is given is hidden.

6. The method of Claim 1, wherein the editing target parameter indicates a start time and an end time of each of plural types of transfer processes performed in the substrate processing apparatus,

wherein the timing chart indicates a start time and an end time of each of the transfer processes according to the time of each process,

wherein the operation instruction is an instruction to change the start time or the end time of a type of a transfer process selected from the plural types of transfer processes according to the time of each process, and

wherein in the act of editing the editing target parameter, a parameter of the changed transfer process is changed according to the start time or the end time of the changed transfer process.

7. The method of Claim 1, wherein in the act of displaying the timing chart, a time range from a start time to an end time of each process is displayed on the recipe editing screen such that correspondence between the start time and the end time of each process in the series of processes and a time of the timing chart is recognizable.

8. The method of Claim 7, further comprising adding a new process before or after a specific process in the series of processes, or deleting a specific step from the series of processes, wherein in the act of displaying the timing chart, a range of the timing chart of the parameter editing screen area corresponding to the added process is expanded along a time axis, or a range of the timing chart of the parameter editing screen area corresponding to the deleted process is reduced along a time axis, and

wherein in the act of editing the editing target parameter, a time included in the parameter of the timing chart is changed in response to the addition or the deletion of the specific process.

9. The method of Claim 1, further comprising performing a consistency check for the parameter edited in the act of editing the editing target parameter and saving the recipe including the edited parameter when a result of the consistency check is normal.

10. The method of Claim 1, wherein in the act of receiving the selection operation, a selection operation that selects an editing target parameter from a group consisting of parameters related to substrate processing and parameters related to substrate transfer is received,

wherein in the act of displaying the timing chart, a setting icon that sets the editing target parameter selected by the selection operation is displayed on the parameter editing screen area in

an editable manner, and

wherein in the act of editing the editing target parameter, the editing target parameter is edited by receiving an operation instruction to edit the setting icon that sets the editing target parameter displayed on the parameter editing screen area, and changing the display in the setting icon according to the operation instruction.

11. The method of Claim 10, wherein the setting icon is selected from the group consisting of a setting icon used for the case where a setting value that sets the editing target parameter is an analog value, a setting icon used for the case where a setting value that sets the editing target parameter is a digital value, and a setting icon used for the case where a setting value that sets the editing target parameter is a command value.

12. A semiconductor device manufacturing method, comprising:
processing a substrate by allowing the substrate processing apparatus to execute the recipe obtained by executing the recipe creation method of any one of Claims 1 to 11.

13. A substrate processing apparatus, comprising
a screen displaying part configured to display a recipe editing screen including a selection screen area that displays a parameter list for selection of parameters included in a recipe that processes a substrate and a parameter editing screen area that edits the parameters;
a parameter receiving part configured to receive a selection operation that selects an editing target parameter from the parameter list displayed on the selection screen area;
a parameter displaying part configured to display, on the parameter editing screen area in an editable manner, a timing chart that is changeable at a time of each process in a series of processes included in a substrate processing process;
a parameter editing part configured to edit the editing target parameter by receiving an operation instruction to edit the timing chart displayed on the parameter editing screen area and changing the timing chart according to the operation instruction;

an operator configured to create the recipe to select the editing target parameter, display a timing chart corresponding to the selected editing target parameter on the parameter editing screen area, and edit a parameter corresponding to the edited timing chart according to the edited timing chart; and

a controller configured to process the substrate by executing the recipe.

14. A recipe creation program that causes, by a computer, a substrate processing apparatus to perform a process comprising:

displaying, on a display, a recipe editing screen including a selection screen area that displays a parameter list for selection of parameters included in a recipe of a substrate processing apparatus and a parameter editing screen area that edits the parameters;

receiving a selection operation that selects an editing target parameter from the parameter list displayed on the selection screen area;

displaying, on the parameter editing screen area, in an editable manner, a timing chart that is changeable at a time of each process in a series of processes included in a substrate processing process; and

editing the editing target parameter by receiving an operation instruction to edit the timing chart displayed on the parameter editing screen area and changing the timing chart according to the operation instruction.

15. The recipe creation program of Claim 14, wherein in the act of displaying the timing chart, a setting icon that sets a parameter related to substrate processing and a parameter related to substrate transfer selected by the selection operation is displayed on the parameter editing screen area in an editable manner, and

in the act of editing the editing target parameter, the editing target parameter is edited by receiving an operation instruction to edit the setting icon that sets the parameter displayed on the parameter editing screen area, and changing the display in the setting icon according to the operation instruction.