

What is claimed is:

1. A polishing apparatus comprising:

a polishing table for supporting a polishing pad;

a top ring configured to apply pressures separately to zones on a back surface of a substrate to press a front surface of the substrate against the polishing pad;

a film-thickness sensor configured to obtain a film-thickness signal that varies in accordance with a film thickness of the substrate; and

a polishing controller configured to manipulate the pressures,

the polishing controller is configured to calculate indexes of a remaining film thickness in zones on the front surface of the substrate, manipulate the pressures based on the indexes for controlling a distribution of the remaining film thickness, and update at least one of control parameters using polishing data obtained during polishing of the substrate, the control parameters being used in controlling of the distribution of the remaining film thickness, the at least one of control parameters comprising a ratio of a changing rate of each index to corresponding one of the pressures, the polishing data including the pressures, the film-thickness signal, and the indexes.

2. The polishing apparatus according to claim 1, wherein the polishing controller is configured to update the at least one of the control parameters before starting manipulation of the pressures on other substrate which is to be polished after polishing of the substrate.

3. The polishing apparatus according to claim 1, wherein the polishing controller is configured to update the at least one of the control parameters during polishing of the substrate.

4. The polishing apparatus according to claim 1, wherein:

the at least one of the control parameters is a parameter included in a process model of a model predictive control; and

the polishing controller is configured to update the at least one of the control parameters to minimize square errors between predicted values of the indexes and actually measured values.

5. The polishing apparatus according to claim 1, wherein the polishing controller is configured to update the at least one of the control parameters based on the indexes and the pressures.

6. The polishing apparatus according to claim 1, wherein the film-thickness sensor is an eddy current sensor.

7. The polishing apparatus according to claim 1, wherein the film-thickness sensor is an optical sensor.

8. A polishing method comprising:

rotating a polishing table supporting a polishing pad;

applying pressures separately to zones on a back surface of a substrate to press a front surface of the substrate against the polishing pad to polish the substrate;

obtaining a film-thickness signal that varies in accordance with a film thickness of the substrate;

calculating indexes of a remaining film thickness in zones on the front surface of the substrate during polishing of the substrate;

manipulating the pressures based on the indexes for controlling a distribution of the remaining film thickness; and

updating at least one of control parameters using polishing data obtained during polishing of the substrate, the control parameters being used in controlling of the distribution of the remaining film thickness, the at least one of control parameters comprising a ratio of a changing rate of each index to corresponding one of the pressures, the polishing data including the pressures, the film-thickness signal, and the indexes.

9. The polishing method according to claim 8, wherein updating the at least one of control parameters comprises updating the at least one of the control parameters before starting manipulation of the pressures on other substrate which is to be polished after polishing of the substrate.

10. The polishing method according to claim 8, wherein updating the at least one of control parameters comprises updating the at least one of the control parameters during polishing of the substrate.

11. The polishing method according to claim 8, wherein:

the at least one of the control parameters is a parameter included in a process model of a model predictive control; and

updating the at least one of control parameters comprises updating the at least one of the control parameters to minimize square errors between predicted values of the indexes and actually measured values.

12. The polishing method according to claim 8, wherein updating the at least one of control parameters comprises updating the at least one of the control parameters based on the indexes and the pressures.