CLAIMS:

1. A method of processing a semiconductor wafer using a double side grinding apparatus that includes a first grinding wheel, a second grinding wheel, and a carrier for supporting the wafer between the first and second grinding wheels, the wafer having a front surface and a back surface, the method comprising:

placing the wafer in the carrier such that the first grinding wheel engages the front surface of the wafer and the second grinding wheel engages the back surface of the wafer;

performing a first grinding operation of the double side grinding apparatus on the wafer in which the first and second grinding wheels rotate in counter-rotation manner relative to each other and the wafer is rotated in a first direction that matches a rotational direction of the first grinding wheel, whereby a first portion of at least one of the front and back surfaces of the wafer is removed;

performing a second grinding operation of the double side grinding apparatus on the wafer in which the first and second grinding wheels rotate in counter-rotation manner relative to each other and the wafer is rotated in a second direction that matches a rotational direction of the second grinding wheel, whereby a second portion of at least one of the front and back surfaces of the wafer is removed; and

performing a third grinding operation of the double side grinding apparatus on the wafer in which the first and second grinding wheels rotate in counter-rotation manner relative to each other and the wafer is rotated in

the first direction or the second direction, whereby a third portion of at least one of the front and back surfaces of the wafer is removed.

2. The method of claim 1, wherein performing the second grinding operation comprises rotating at least one of the first grinding wheel, the second grinding wheel, and the wafer at a second rotational speed that is different than a first rotational speed of the at least one of the first grinding wheel, the second grinding wheel, and the wafer during the first grinding operation.

3. The method of claim 2, wherein performing the second grinding operating comprises rotating the wafer at a second rotational speed that is different than a first rotational speed of the wafer during the first grinding operation.

4. The method of claim 3, wherein the second rotational speed of the wafer is greater than the first rotational speed of the wafer.

5. The method of claim 1, wherein performing the second grinding operation comprises positioning at least one of the first grinding wheel and the second grinding wheel at a second orientation relative the wafer that is different than a first orientation of the at least one of the first grinding wheel and the second grinding wheel during the first grinding operation.

6. The method of claim 5, wherein, in one of the first orientation and the second orientation, the at least one of the first grinding wheel and the second grinding wheel is oriented at an oblique angle relative to

the wafer and, in the other one of the first orientation and the second orientation, the at least one of the first grinding wheel and the second grinding wheel is oriented substantially parallel to the wafer.

7. The method of claim 1, wherein performing the second grinding operation comprises supplying grinding fluid to the double side grinding apparatus at a second flow rate that is different than a first flow rate of the grinding fluid supplied during the first grinding operation.

8. The method of claim 1, wherein performing the second grinding operation further comprises adjusting, relative to the first grinding operation, at least one process parameter selected from the group consisting of a rotational speed of the wafer, a rotational speed of the first grinding wheel, a rotational speed of the second grinding wheel, an orientation of the first grinding wheel relative to the wafer, an orientation of the second grinding wheel relative to the wafer, and a flow rate of grinding fluid supplied to the double side grinding apparatus.

9. The method of claim 1, wherein performing the second grinding operation whereby the second portion of at least one of the front and back surfaces of the wafer is removed enhances at least one of in plane displacement, warp, and nanotopology of the wafer.

10. A method of processing a semiconductor wafer using a double side grinding apparatus that includes a first grinding wheel, a second grinding wheel, and a carrier for supporting the wafer between the first and

second grinding wheels, the wafer having a front surface and a back surface, the method comprising:

placing the wafer in the carrier such that the first grinding wheel engages the front surface of the wafer and the second grinding wheel engages the back surface of the wafer;

performing a first grinding operation of the double side grinding apparatus on the wafer in which the first and second grinding wheels rotate in counter-rotation manner relative to each other and the wafer is rotated in a wafer rotation direction that matches a rotational direction of one of the first grinding wheel and the second grinding wheel, whereby a first portion of at least one of the front and back surfaces of the wafer is removed;

performing a second grinding operation of the double side grinding apparatus on the wafer in which at least one process parameter is adjusted relative to the first grinding operation, whereby a second portion of at least one of the front and back surfaces of the wafer is removed to enhance at least one of in plane displacement, warp, and nanotopology of the wafer; and

performing a third grinding operation of the double side grinding apparatus on the wafer, whereby a third portion of at least one of the front and back surfaces of the wafer is removed.

11. The method of claim 10, wherein the at least one process parameter is selected from the group consisting of the wafer rotation direction, a rotational speed of the wafer, a rotational speed of the first grinding wheel, a rotational speed of the second grinding wheel, an

orientation of the first grinding wheel relative to the wafer, an orientation of the second grinding wheel relative to the wafer, and a flow rate of grinding fluid supplied to the double side grinding apparatus.

12. The method of claim 10, wherein performing the third grinding operation of the double side grinding apparatus comprises adjusting at least one process parameter relative to the first grinding operation or the second grinding operation, whereby the third portion of at least one of the front and back surfaces of the wafer is removed to enhance at least one of in plane displacement, warp, and nanotopology of the wafer.

13. The method of claim 10, wherein performing the second grinding operation comprises rotating the wafer in an opposite wafer direction that matches a rotational direction of the other one of the first grinding wheel and the second grinding wheel.

14. The method of claim 10, wherein the at least one process parameter is a rotational speed of the wafer, wherein performing the second grinding operating comprises rotating the wafer at a second rotational speed that is greater than a first rotational speed of the wafer during the first grinding operation.

15. The method of claim 10, wherein the at least one process parameter comprises at least one of an orientation of the first grinding wheel relative to the wafer and an orientation of the second grinding wheel relative to the wafer, wherein performing the second grinding operation comprises positioning at least one of the first grinding wheel and the second grinding wheel at a

second orientation relative the wafer that is different than a first orientation of the at least one of the first grinding wheel and the second grinding wheel during the first grinding operation.

16. The method of claim 10, wherein the at least one process parameter comprises a flow rate of grinding fluid supplied to the double side grinding apparatus, wherein performing the second grinding operation comprises supplying grinding fluid to the double side grinding apparatus at a second flow rate that is different than a first flow rate of the grinding fluid supplied during the first grinding operation.

17. A method of processing semiconductor wafers using a double side grinding apparatus that includes first grinding wheels, second grinding wheels each corresponding to one of the first grinding wheels, and carriers for respectively supporting each of the wafers between one of the first grinding wheels and the corresponding second grinding wheel during a grinding operation, each wafer having a front surface and a back surface, the method comprising, for each wafer:

placing the wafer in the respective carrier such that the first grinding wheel engages the front surface of the respective wafer and the corresponding second grinding wheel engages the back surface of the respective wafer;

performing a first grinding operation of the double side grinding apparatus on the wafer in which the first and corresponding second grinding wheels rotate in counter-rotation manner relative to each other and the respective wafer is rotated in a wafer rotation direction

that matches a rotational direction of the first grinding wheel, whereby a first portion of at least one of the front and back surfaces of the respective wafer is removed;

performing a second grinding operation of the double side grinding apparatus on the wafer in which the first and corresponding second grinding wheels rotate in counter-rotation manner relative to each other and the respective wafer is rotated in a second direction that matches a rotational direction of the second grinding wheel, whereby a second portion of at least one of the front and back surfaces of the respective wafer is removed; and

performing a third grinding operation of the double side grinding apparatus on the wafer, whereby a third portion of at least one of the front and back surfaces of the respective wafer is removed.

18. The method of claim 17, further comprising, for each wafer, performing the third grinding operation in which at least one process parameter selected from the group consisting of a rotational speed of the respective wafer, a rotational speed of the first grinding wheel, a rotational speed of the second grinding wheel, an orientation of the first grinding wheel relative to the respective wafer, an orientation of the second grinding wheel relative to the respective wafer, and a flow rate of grinding fluid supplied to the double side grinding apparatus is adjusted relative to at least one of the first grinding operation and the second grinding operation.

19. The method of claim 17, wherein performing the second grinding operation whereby the second portion of

at least one of the front and back surfaces of the respective wafer is removed enhances at least one of in plane displacement, warp, and nanotopology of the respective wafer.