CLAIMS

1. A substrate processing system, comprising:

a processing chamber defining a processing zone;

a first chuck array coupled to a first transport mechanism positioned on a first side, wherein the first chuck array is configured to be linearly movable back and forth on the first transport mechanism;

a second chuck array coupled to a second transport mechanism positioned on a second side, opposite the first side, wherein the second chuck array is configured to be linearly movable back and forth on the second transport mechanism;

and wherein each of the first and second transport mechanism is configured to be movable in elevation direction to enable one of the first and second chuck arrays to pass below the other one of the first and second chuck arrays .

2. The system of claim 1, further comprising a loading mechanism configured for loading substrates onto the first and second chuck arrays.

3. The system of claim 2, further comprising unloading mechanism configured for unloading substrates onto the first and second chuck arrays.

4. The system of claim 2, wherein the loading mechanism further comprises alignment mechanism.

5. The system of claim 4, wherein each of the first and second chuck arrays comprises a plurality of electrostatic chucks.

6. The system of claim 5, wherein each of the first and second chuck arrays comprises a plurality of rows of electrostatic chucks.

7. The system of claim 4, wherein each of the first and second chuck arrays is configured to be moved at a first speed while traversing the processing zone and at a second speed, faster than the first speed, when moved outside the processing zone.

8. The system of claim 5, wherein the loading mechanism comprises a plurality of electrostatic chucks configured to chuck wafers from front side of the wafers.

9. The system of claim 8, wherein the loading mechanism comprises alignment pawl configured for urging wafers against static alignment pins.

10. The system of claim 9, further comprising an alignment camera.

11. A wafer processing system, comprising:

a vacuum enclosure;

a processing chamber attached to the vacuum enclosure and defining a processing zone within the vacuum enclosure;

a first rail assembly positioned inside the vacuum enclosure on one side of the processing chamber;

a first elevation mechanism coupled to the first rail assembly and configured to raise the first rail assembly to elevated position and lower the first elevation assembly to lower position;

a second rail assembly positioned inside the vacuum enclosure on oposite side of the first rail assembly;

a second elevation mechanism coupled to the second rail assembly and configured to raise the second rail assembly to elevated position and lower the second elevation assembly to lower position;

a first chuck assembly positioned and configured to ride on the first rail assembly; and,

a second chuck assembly positioned and configured to ride on the second rail assembly.

12. The system of claim 11, further comprising a wafer delivery mechanism positioned inside the vacuum enclosure and a wafer removal mechanism positioned in side the vacuum assembly.

13. The system of claim 12, further comprising a first pick-and-place assembly configured to transfer wafers from the wafer delivery mechanism to the first and second chuck assemblies, and a second pick-and-place assembly configured to transfer wafers from the first and second chuck assemblies to the wafer removal mechanism.

14. The system of claim 13, wherein the wafer delivery mechanism comprises a first conveyor belt and the wafer removal mechanism comprises a second conveyor belt.

15. The system of claim 14, wherein the pick-and-place assembly comprises a pickup head having a plurality of pickup chucks configured for simultaneously chucking a plurality of wafers.

16. The system of claim 15, wherein each of the chuck assemblies comprises a plurality of electrostatic chucks.

17. The system of claim 16, wherein the pick-and-place assembly further comprises actuators configured to align the wafers to the plurality of chucks.

18. The system of claim 17, wherein each of the chuck assemblies comprises a plurality of alignment pins configured for aligning the wafers by urging the wafers against the alignment pins.

19. In a system having a loading zone, a transport zone, an unloading zone, and a processing zone, a method for processing wafers, comprising:

loading plurality of wafers onto a chuck array in a loading zone;

transporting the chuck array at a first speed towards the processing zone and, once arriving at the processing zone transporting the chuck array at a second speed slower than the first speed;

processing the wafers during transport in the processing zone;

once processing zone has been traversed, transporting the chuck array at the first speed towards unloading zone and unloading the wafers at the unloading zone;

once the wafers have been unloaded, lowering the chuck array and returning the loading zone at the first speed.

20. The method of claim 19, wherein loading plurality of wafers comprises the steps:

activating a pickup head to pick up a plurality of wafers;

moving the pickup head to place the plurality of wafers over the chuck array;

activating gas flow into the chuck array to thereby generate air cushions;

activating the pickup head to release the plurality of wafers over the gas cushions;

aligning the plurality of wafers;

terminating the gas flow and chucking the wafers to the chuck array.

AMENDED CLAIMS
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1. A substrate processing system, comprising:

a processing chamber defining a processing zone;

a first chuck array coupled to a first transport mechanism positioned on a first side, wherein the first chuck array is configured to be linearly movable back and forth on the first transport mechanism;

a second chuck array coupled to a second transport mechanism positioned on a second side, opposite the first side, wherein the second chuck array is configured to be linearly movable back and forth on the second transport mechanism;

and wherein each of the first and second transport mechanism is configured to be movable in elevation direction to enable one of the first and second chuck arrays to pass below the other one of the first and second chuck arrays .

2. The system of claim 1, further comprising a loading mechanism configured for loading substrates onto the first and second chuck arrays.

3. The system of claim 2, further comprising unloading mechanism configured for unloading substrates onto the first and second chuck arrays.

4. The system of claim 2, wherein the loading mechanism further comprises alignment mechanism.

5. The system of claim 4, wherein each of the first and second chuck arrays comprises a plurality of electrostatic chucks.

6. The system of claim 5, wherein each of the first and second chuck arrays comprises a plurality of rows of electrostatic chucks.

7. The system of claim 4, wherein each of the first and second chuck arrays is configured to be moved at a first speed while traversing the processing zone and at a second speed, faster than the first speed, when moved outside the processing zone.

8. The system of claim 5, wherein the loading mechanism comprises a plurality of electrostatic chucks configured to chuck wafers from front side of the wafers.

9. The system of claim 8, wherein the loading mechanism comprises alignment pawl configured for urging wafers against static alignment pins.

10. The system of claim 9, further comprising an alignment camera.

11. A wafer processing system, comprising:

a vacuum enclosure;

a processing chamber attached to the vacuum enclosure and defining a processing zone within the vacuum enclosure;

a first rail assembly positioned inside the vacuum enclosure on one side of the processing chamber;

a first elevation mechanism coupled to the first rail assembly and configured to raise the first rail assembly to elevated position and lower the first rail assembly to lower position;

a second rail assembly positioned inside the vacuum enclosure on opposite side of the first rail assembly;

a second elevation mechanism coupled to the second rail assembly and configured to raise the second rail assembly to elevated position and lower the second rail assembly to lower position;

a first chuck assembly positioned and configured to ride on the first rail assembly; and,

a second chuck assembly positioned and configured to ride on the second rail assembly.

12. The system of claim 11, further comprising a wafer delivery mechanism positioned inside the vacuum enclosure and a wafer removal mechanism positioned inside the vacuum assembly.

13. The system of claim 12, further comprising a first pick-and-place assembly configured to transfer wafers from the wafer delivery mechanism to the first and second chuck assemblies, and a second pick-and-place assembly configured to transfer wafers from the first and second chuck assemblies to the wafer removal mechanism.

14. The system of claim 13, wherein the wafer delivery mechanism comprises a first conveyor belt and the wafer removal mechanism comprises a second conveyor belt.

15. The system of claim 14, wherein the pick-and-place assembly comprises a pickup head having a plurality of pickup chucks configured for simultaneously chucking a plurality of wafers.

16. The system of claim 15, wherein each of the chuck assemblies comprises a plurality of electrostatic chucks.

17. The system of claim 16, wherein the pick-and-place assembly further comprises actuators configured to align the wafers to the plurality of chucks.

18. The system of claim 17, wherein each of the chuck assemblies comprises a plurality of alignment pins configured for aligning the wafers by urging the wafers against the alignment pins.

19. In a system having a loading zone, a transport zone, an unloading zone, and a processing zone, a method for processing wafers, comprising:

loading plurality of wafers onto a chuck array in a loading zone;

transporting the chuck array at a first speed towards the processing zone and, once arriving at the processing zone transporting the chuck array at a second speed slower than the first speed;

processing the wafers during transport in the processing zone;

once processing zone has been traversed, transporting the chuck array at the first speed towards unloading zone and unloading the wafers at the unloading zone;

once the wafers have been unloaded, lowering the chuck array and returning the chuck array to the loading zone at the first speed.

20. The method of claim 19, wherein loading plurality of wafers comprises the steps:
activating a pickup head to pick up a plurality of wafers;
moving the pickup head to place the plurality of wafers over the chuck array;
activating gas flow into the chuck array to thereby generate air cushions;
activating the pickup head to release the plurality of wafers over the gas cushions;
aligning the plurality of wafers;
terminating the gas flow and chucking the wafers to the chuck array.

CLAIMS

1. A substrate processing system, comprising:

a processing chamber defining a processing zone;

a first chuck array coupled to a first transport mechanism positioned on a first side, wherein the first chuck array is configured to be linearly movable back and forth on the first transport mechanism;

a second chuck array coupled to a second transport mechanism positioned on a second side, opposite the first side, wherein the second chuck array is configured to be linearly movable back and forth on the second transport mechanism;

and wherein each of the first and second transport mechanism is configured to be movable in elevation direction to enable one of the first and second chuck arrays to pass below the other one of the first and second chuck arrays .

2. The system of claim 1, further comprising a loading mechanism configured for loading substrates onto the first and second chuck arrays.

3. The system of claim 2, further comprising unloading mechanism configured for unloading substrates onto the first and second chuck arrays.

4. The system of claim 2, wherein the loading mechanism further comprises alignment mechanism.

5. The system of claim 4, wherein each of the first and second chuck arrays comprises a plurality of electrostatic chucks.

6. The system of claim 5, wherein each of the first and second chuck arrays comprises a plurality of rows of electrostatic chucks.

7. The system of claim 4, wherein each of the first and second chuck arrays is configured to be moved at a first speed while traversing the processing zone and at a second speed, faster than the first speed, when moved outside the processing zone.

8. The system of claim 5, wherein the loading mechanism comprises a plurality of electrostatic chucks configured to chuck wafers from front side of the wafers.

9. The system of claim 8, wherein the loading mechanism comprises alignment pawl configured for urging wafers against static alignment pins.

10. The system of claim 9, further comprising an alignment camera.