CLAIMS

1. A substrate processing apparatus (100), comprising:

a reaction chamber (120) for accommodating substrates (130) arranged with their surfaces facing each other;

a fluid distributor (600) for establishing a laminar fluid flow propagating from an entrance to the reaction chamber (120) through the length of the reaction chamber (120) and between the substrate surfaces; and

a liftable substrate rotating system (500) configured to transfer the substrates (130), in a direction perpendicular to the substrate surfaces, between a loading position and a processing position and to rotate the substrates (130) in the processing position within the reaction chamber (120).

2. The substrate processing apparatus (100) of claim 1, wherein the fluid distributor (600) is configured to expand the fluid flow received from inlets (610a, 610b) to a width of the reaction chamber (120) before the fluid flow enters the reaction chamber (120).

3. The substrate processing apparatus (100) of any preceding claim, wherein the fluid distributor (300) comprises an expansion volume comprising expansion regions (620a, 620b) into which fluid streams (F1, F2), respectively, are received via at least one inlet (610a, 610b) arranged on each expansion region such that said fluid streams (F1, F2) propagate through the expansion regions (620a, 620b) in directions essentially towards one another while laterally expanding, and a transition region (630), in which fluid streams (F1, F2) arriving thereto via the expansion regions (620a, 620b) combine, wherein the transition region (630) is configured to further direct the combined fluid stream into the reaction chamber (120) as a laminar flow.

4. The substrate processing apparatus (100) of any preceding claim, wherein the fluid distributor (600) is configured to spread the fluid flow (F1, F2) in a direction parallel to the height of a substrate stack formed of the substrates (130) arranged with their surfaces facing each other.

5. The substrate processing apparatus (100) of any preceding claim, wherein the fluid distributor (600) comprises a transition region (630) that is mirror symmetric with respect to a longitudinal axis of the reaction chamber (120).

6. The substrate processing apparatus (100) of any one of the claims 1-5, wherein the transition region (630) of the fluid distributor (600) is non-mirror symmetric with respect to the longitudinal axis of the reaction chamber (120).

7. The substrate processing apparatus (100) of any preceding claim, comprising an external housing (110) at least partially accommodating the reaction chamber (120), the external housing being configured to have the substrates positioned therein at the loading position.

8. The substrate processing apparatus (100) of claim 7, configured to maintain a pressure difference between the reaction chamber (120) and the external housing (110) during substrate processing.

9. The substrate processing apparatus (100) of any preceding claim, comprising a reaction chamber lid (180) integrated to the liftable substrate rotating system (500).

10. The substrate processing apparatus (100) of claim 9, configured to maintain a gap between the lid (180) and the reaction chamber (120) at the processing position such that the reaction chamber (120) and the external housing (110) are in fluid communication during substrate processing.

11. The substrate processing apparatus (100) of any preceding claim, wherein the liftable substrate rotating system (500) comprises a rotating axle (150) within a lifting axle (160).

12. The substrate processing apparatus (100) of any preceding claim, wherein the lifting axle (160) is configured to move perpendicular to the longitudinal axis of the reaction chamber (120), wherein the longitudinal axis is parallel to the laminar flow direction within the reaction chamber (120).

13. The substrate processing apparatus (100) of any preceding claim, configured to rotate the substrates (130) in the reaction chamber (120) in a plane perpendicular to the lifting axle (160).

14. A substrate processing apparatus (100) of any preceding claim, wherein the liftable substrate rotating system (500) comprises a rotation motor (155) configured to rotate the substrates (130) and a lifting motor (165) configured to transfer the substrates (130) between the loading position and the processing position, wherein the rotating motor (155)

and the lifting motor (165) are located outside the reaction chamber (120) and the external housing (110).

15. A liftable substrate rotating system (500) for the substrate processing apparatus (100) of any preceding claim, comprising:

a lifting mechanism comprising a lifting axle (160) for transferring transfer substrates (130), in a direction perpendicular to substrate surfaces, between a loading position and a processing position, the lifting axle (160) being attachable to a lid (180) to a reaction chamber (120); and

a rotation mechanism comprising a rotating axle (150) for rotating substrates (130) independently of the lifting axle (160) (130) within the reaction chamber (120).

16. The liftable substrate rotating system (500) of claim 15, comprising the rotating axle (150) within a lifting axle (160).

17. The liftable substrate rotating system (500) of claim 15 or 16, comprising:

the lid (180) to the reaction chamber (120); and

a rotatable substrate holder (140) located on one side of the lid (180) opposite to the lifting axle (160) configured to accommodate the substrates (130) arranged with their surfaces facing each other, wherein the rotating axle (150) is configured to rotate the substrates (130) through rotating the substrate holder (140).

18. The liftable substrate rotating system (500) of any of claims 15-17, comprising a vacuum feedthrough (170).

19. The liftable substrate rotating system (500) of any of claims 15-18, wherein the lid (180) comprises alignment tension springs configured to secure tight and even fit against a reaction chamber (120) at the processing position.

20. A method, comprising:

loading substrates (130) as a substrate stack with substrate surfaces facing each other in a substrate holder (140) into a reaction chamber (120) of a substrate processing apparatus (100);

rotating substrates (130) in a laminar precursor flow within the reaction chamber (120).